

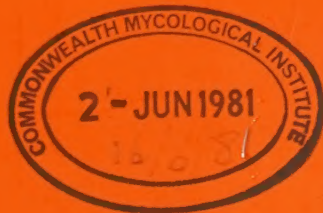
91/9

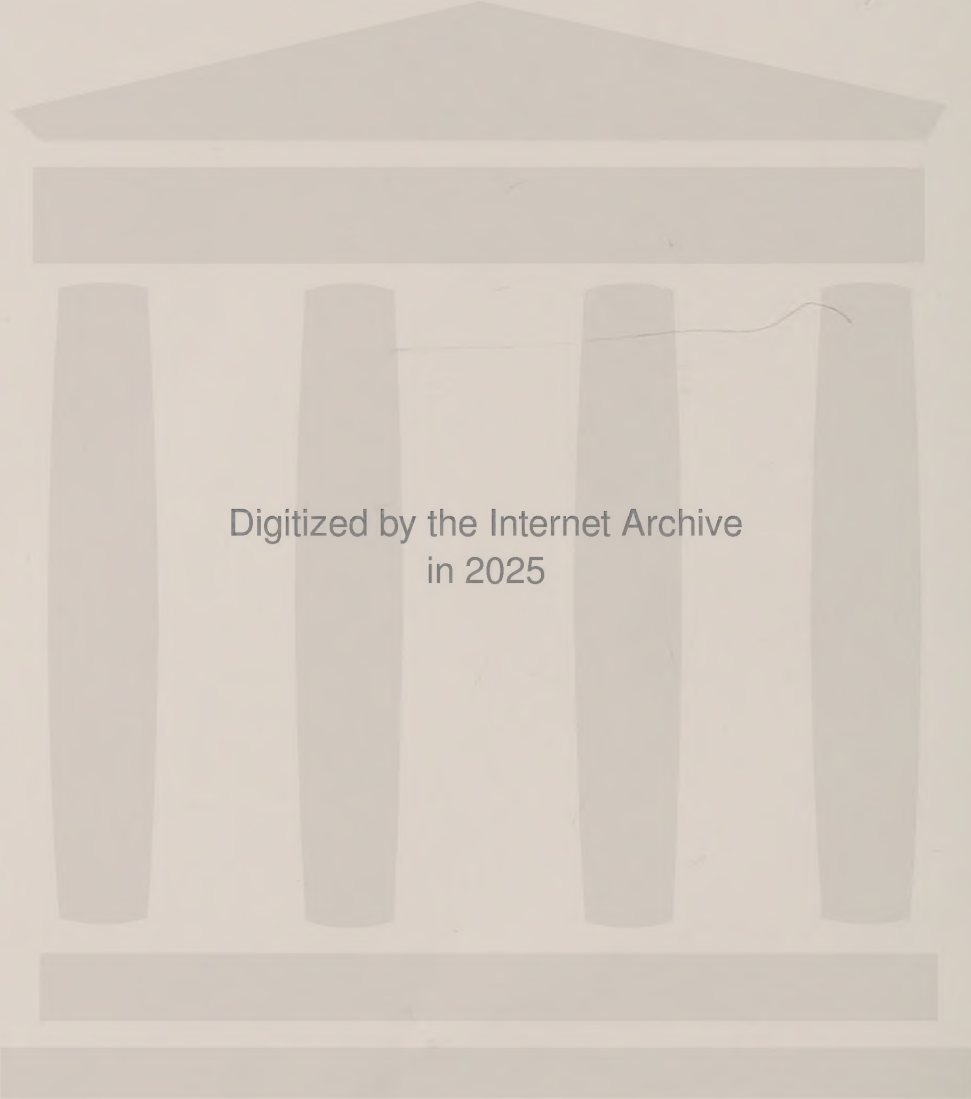


ANNUAL REPORT 1978-79

DEPARTMENT OF AGRICULTURE NEW SOUTH WALES

IF
RPP
RMVM
BSM





Digitized by the Internet Archive
in 2025

1980-81

PARLIAMENT OF NEW SOUTH WALES

REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

Year ended 30th June, 1979

Ordered to be printed, 5 March, 1981

BY AUTHORITY
D. WEST, GOVERNMENT PRINTER, NEW SOUTH WALES—1981

1980-81

PARLIAMENT OF NEW SOUTH WALES

REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

Year ended 30th June, 1979

Ordered to be printed 2 March, 1981

BY APPOINTMENT PRINTERS TO THE PARLIAMENT OF NEW SOUTH WALES

The Hon. D. DAY, M.P.,

Minister for Agriculture,
Sydney.

Sir,

I have the honour to present a report reviewing the activities of the Department of Agriculture for the year ended 30th June, 1979.

R. M. WATTS,
Director-General.

The objectives of the New South Wales Department of Agriculture are to safeguard, and improve the productivity of, the agricultural industries of New South Wales; and to encourage the orderly marketing of safe, acceptable produce, with consequent improvement in the prosperity and quality of life of both rural and urban communities.

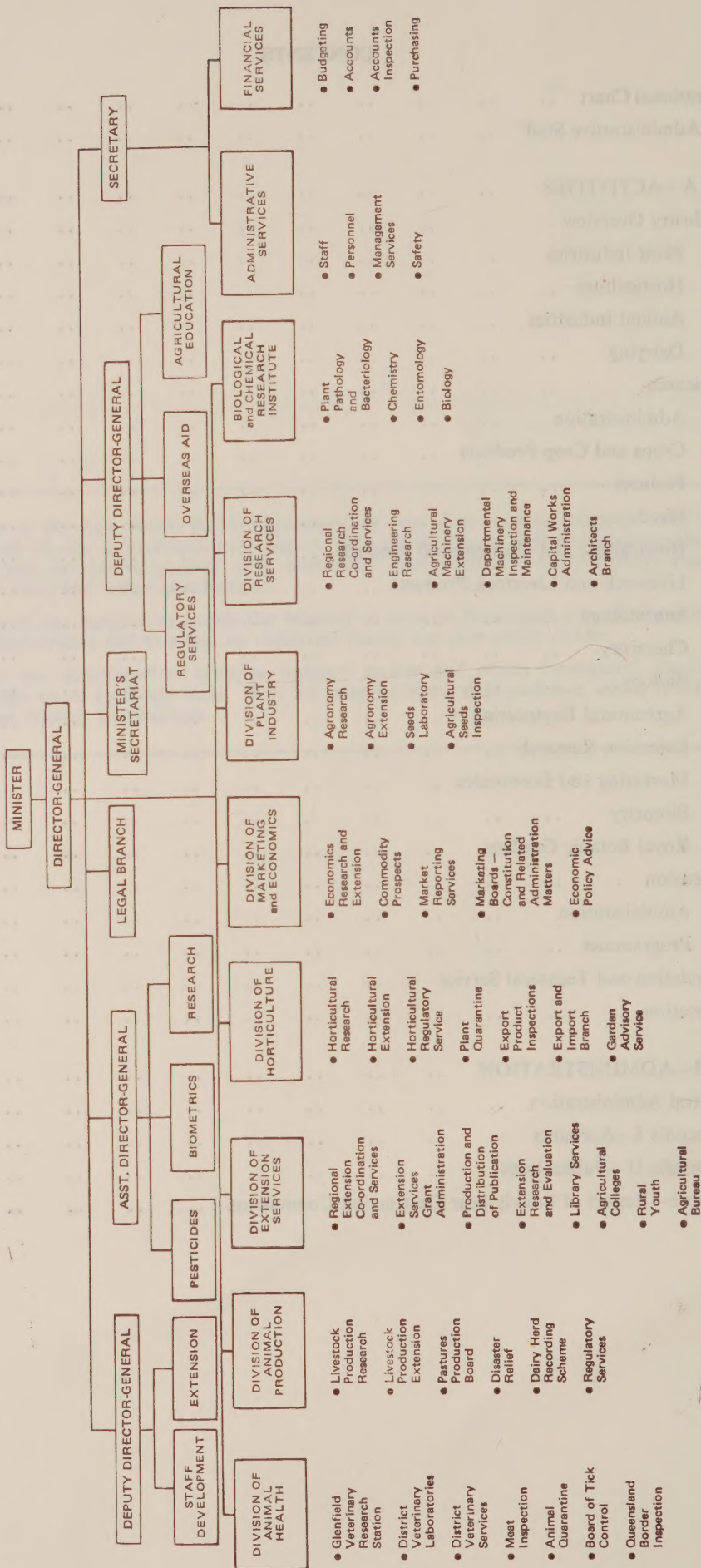
The main aim of this report is to enable the Minister to table in Parliament a comprehensive record of what the Department did to attain its objectives during the year under review.

This report is also distributed to libraries, industry leaders and others throughout Australia and overseas, usually on an exchange basis. It is not intended for a wide audience, which is catered for by other, more regular, publications.

CONTENTS

Organizational Chart	6
Senior Administrative Staff	7
PART A—ACTIVITIES	9
Industry Overview	9
Plant Industries	9
Horticulture	12
Animal Industries	15
Dairying	17
Research	19
Administration	19
Crops and Crop Products	21
Pastures	22
Weeds	23
Horticulture and Horticultural Products	24
Livestock and Livestock Products	27
Entomology	30
Chemistry	31
Biology	33
Agricultural Engineering	34
Extension Research	34
Marketing and Economics	35
Biometry	35
Royal Botanic Gardens	36
Extension	37
Administration	37
Programmes	39
Regulation and Technical Service	44
Education	58
PART B—ADMINISTRATION	61
Central Administration	61
Appendix I—Accounts	73
Appendix II—Publications	81
Annexe—Report of Prickly-pear Destruction Commission	105

NEW SOUTH WALES DEPARTMENT OF AGRICULTURE



SENIOR ADMINISTRATIVE PERSONNEL

As at 30th June, 1979

Minister	Hon. D. DAY, M.P.
Director-General	R. M. WATTS
Deputy Director-General	B. OWEN FRENCH
Deputy Director-General	Dr R. B. DUN
Assistant Director-General	Dr K. P. SHERIDAN
Secretary	R. E. JONES
Assistant Secretary (Finance)	D. A. SMITH
Assistant Secretary (Administration)	W. G. BRYANT
Chiefs of Divisions:	
Animal Industry*	D. H. MUMFORD
Dairying†	Dr G. J. SMITH
Horticulture	G. R. GREGORY
Plant Industry	Dr S. G. GRIMMETT
Marketing and Economics	Dr D. E. MACCALLUM
Extension Services	F. S. BENECKE
Research Services	K. E. HUTTON
Chief Biometrician	E. A. ROBERTS
Director of Pesticides and Environmental Studies	L. R. GREENUP
Biological and Chemical Research Institute Management Committee:	
Chairman and Director of Entomology	M. CASIMIR
Acting Director of Biology	Dr K. J. MOORE
Director of Chemistry	Dr F. R. HIGGINSON
Executive Officer	C. J. PARKER
Director and Chief Botanist, Royal Botanic Gardens and National Herbarium	Dr L. A. S. JOHNSON
Director, Aid Programmes	J. H. BALLARD
Principals, Agricultural Colleges:	
C. B. Alexander Agricultural College	G. C. McFARLANE
Orange Agricultural College	R. J. NAPIER
Yanco Agricultural College	K. W. BANNISTER

* As from 2nd July, 1979, Animal Health; Animal Production.

† As from 2nd July, 1979, Animal Production.

PART A—ACTIVITIES

INDUSTRY OVERVIEW

PLANT INDUSTRIES

THE SEASON

After generally dry conditions in March/April, 1978, farmers commenced sowing their winter grain crops after falls of rain in early to mid-May. A large area was sown very late because of rain in June, particularly in the north. The total area sown to winter crops was about 4 090 000 ha, about 2 per cent below that sown in the previous season.

The dry weather in early autumn enabled most summer crops to be harvested under good conditions.

Mild temperatures during the spring enabled all winter crops, even those sown very late, to make maximum growth; this, combined with a low incidence of disease, resulted in very high yields. Wheat and barley production was at a record level, and the oat yield was the highest ever. However, lupin yields were sometimes disappointing because of excessive vegetative growth.

Pasture growth in the spring was very productive. Conditions were also favourable for summer crop sowings, although in some areas cold and wet soils affected germination. However, heatwave conditions in January/February reduced the yield potential of dryland summer crops and dried out pastures.

Moderate and well-spaced falls of rain in May enabled winter crops to be sown at the optimum time. Follow-up rains in early June resulted in excellent germination and early growth. However, as soils are lacking subsoil moisture, timely follow-up rains during the remainder of the season are necessary to produce satisfactory yields.

WINTER CEREALS

Crop estimates for winter cereals

Crop	1978/79 (estimated)				1977/78			
	Area ('000 ha)		Grain production ('000 t)	Yield (t/ha)	Area ('000 ha)		Grain production ('000 t)	Yield (t/ha)
	Total	For grain			Total	For grain		
Wheat	3 380	3 128	6 640	2.12	3 600	3 377	3 846	1.14
Oats	650	447	647	1.45	574	288	242	0.84
Barley	500	468	689	1.47	513	486	446	0.92
Ryecorn	N.A.	N.A.	N.A.	N.A.	5	3	2	0.65

Wheat

Because of excess rain, intended sowings were reduced by 10 per cent. Above-average rainfall was recorded in most months of the growing season, and mild conditions in November prolonged the season. These factors, combined with an increased use of semi-dwarf varieties, resulted in the highest production (over 6.6 million tonnes) and yield (over 2 t/ha) on record.

Little yield reduction occurred through leaf diseases. There was no serious damage from stem rust because of mild spring temperatures and the high percentage of resistant varieties sown.

The popularity of the new semi-dwarf varieties is increasing. In 1978, Songlen was sown on 19 per cent of the total area, although it was released for commercial cultivation only two years previously. Condor appears to have reached its peak, with slightly over 20 per cent of the total area; however, Egret is still increasing, mainly because it is now recommended for a larger area of the State. Standard height varieties, such as Timgalen and Olympic, are declining in popularity. Durati, bred at Tamworth Agricultural Research Centre, was released for commercial cultivation. It is a high-yielding, rust-resistant, strong-strawed durum variety.

Direct-drilling and reduced cultivation techniques attracted much attention last season. During the early winter it was often possible to direct-drill into uncultivated land that had been sprayed for weed control; wet conditions prevented sowing in fallowed paddocks.

Oats

Cooba and Coolabah are maintaining their leading and second positions, respectively, as the most popular oat varieties. The comparatively new dual-purpose variety, Blackbutt, has found ready acceptance with farmers, especially on the tablelands and higher rainfall areas, while Belar and Swan are declining in popularity. Saia is still an important variety for grazing on the coast.

The season was very favourable for oats. Timely autumn rains allowed early sowing. The favourable season, plus minimal grazing, resulted in record yields of grain. Farm storage of oat grain is now at a high level. This fact, plus the lack of early autumn rains, is expected to lead to reduced sowings of oats in 1979.

Barley

The 1978-9 season was not as favourable for barley as it was for wheat and oats, because of excessive rain in some areas. The late sowing season for winter cereals resulted in a record area sown to barley. Deliveries to the Barley Board for sale on the export and domestic markets amounted to 310 000 t. The variety Clipper was the most popular, accounting for two-thirds of the area sown. The six-row varieties are rapidly declining in popularity. Lara is steadily increasing in popularity, at the expense of the older varieties, Research and Resibee.

Several thousand hectares of triticale were grown.

SUMMER CEREALS

Rice

An all-time record crop yielded 680 000 t of paddy rice from an area of 106 000 ha. The excellent results were achieved by a combination of ideal seasonal conditions and the high standard of farming.

Grain Sorghum

The harvest was up by 75 per cent because the increase in the area of spring plantings was complemented by good soil moisture. Grain was bright and attractive, following the trend to hetero-yellow hybrids. Off-type sorghum infestations were significantly reduced.

Yellow Maize

Production remained stable, following an inland expansion of 10 per cent and a 20 per cent fall in the north coast crop.

Sweet Corn

Production spread along the Macquarie Valley to meet the increased demand for frozen cobs. Cob quality was retained in spite of heatwaves during the harvest. Yields of up to 26 t/ha were reported.

OTHER CROPS

Grain Legumes

Lupin production resulted in the export of 5 000 t to the EEC countries. There was a strong demand for the grain, and seed supplies met sowing requirements for the first time. Areas of field peas, mung beans, cowpeas, horse beans and dry beans were also grown.

Cotton

A record area, estimated at 34 000 ha, was planted which, with excellent summer growing conditions and favourable autumn temperatures, produced approximately 170 000 bales. The season was conducive to good-quality fibre and high yields. Harvesting commenced in early April and was almost complete at the end of June. Quality and yield reductions due to wet weather were minor, as were the incidence and effects of disease.

Tobacco

The area contracted further to 764 ha. However, in response to favourable growing conditions, record leaf yields were achieved and production approached 1 300 t of leaf, slightly more than the 1979 marketing quota. Leaf quality was above average and the widespread use of a new systemic fungicide prevented significant yield loss from blue mould disease.

Winter Oilseeds

Increased areas were sown to rapeseed and safflower, estimated at 5 500 ha and 30 000 ha respectively. The linseed area contracted to 2 500 ha. Wet conditions experienced during winter/early spring caused some crop losses; however, above-average rainfall and mild temperatures in late spring resulted in above-average yields for most districts. Production was estimated as: linseed, 2 000 t; rapeseed, 5 500 t; and safflower, 22 000 t.

Soybeans

In response to increasing grower experience and continued market buoyancy, the area sown expanded to a record 20 000 ha. The majority of the crop was grown in the central and northern inland river valleys under irrigation. However, 20 per cent of the State area was grown without irrigation in the North Coast Region. Heatwave conditions and insect pest attacks reduced the yield potential in inland districts. Favourable mid to late summer conditions were experienced in

coastal districts and satisfactory yields were achieved. Minor harvest delays had little effect on yields or seed quality, and State production approached 40 000 t.

Sunflower

Interest in sunflower, although at a high level, was frustrated by prolonged wet conditions in late winter/spring and the dry, hot conditions of January. Most of the 75 000 ha area was sown between November and late January. Extremely high populations of insect pests (mainly rutherghlen bug), combined with the heatwave conditions, lowered yields in many districts. Yields from irrigated crops, about 10 per cent of the total area, were below normal due to heavy water demand. On the north-west slopes and plains, yields from January/February sowings were most satisfactory, the later sowings avoiding the extreme temperatures and increased insect pest populations. Most of the area was sown to hybrid varieties, and losses attributed to red rust disease were negligible. Head rots induced by insect damage caused significant yield losses. Harvesting was almost complete at the end of June, with production likely to reach 40 000 t.

Miscellaneous Crops

The buckwheat area contracted to 3 000 ha and, in the absence of effective summer rainfall in the tablelands, produced less than 1 000 t. Commercial production of peanuts was basically confined to irrigated production in the Wee Waa area (200 ha). A number of crops of possible importance attracted the attention of growers and resulted in limited or pioneering production. Most interest was expressed in jojoba and a number of observational nurseries were established throughout the State. Approximately 40 ha of tea was planted near Murwillumbah, with prospects for a further 40 ha in 1980. Small areas of tea tree were established on the north coast.

PASTURES

Lucerne

The advantages of growing lucerne varieties resistant to the new spotted alfalfa aphid (*Therioaphis trifolii*) some of which were also tolerant to the blue green aphid (*Acyrtosiphon kondoi*) were generally recognized, and large-scale sowings were made on many farms. On the market were fifteen varieties imported from California, as well as the spotted-alfalfa-tolerant variety Falkiner that was developed by the CSIRO. However, seed scarcity and high prices restricted sowings of resistant varieties, and some farmers continued to plant the highly susceptible Hunter River lucerne. Provided care was taken in choosing varieties (because of differences in adaptation to both grazing and seasonal production), the new lucernes proved to be suitable interim replacements for Hunter River.

Many new varieties were resistant to the disease root rot (*Phytophthora megasperma*); this proved to be a distinct benefit where irrigation was practised and soils were not well drained. There was evidence that some imported varieties may be susceptible to foliar diseases.

In the first year of aphid attack, the damage to lucerne and medics was estimated to be \$26 million. The aphids continued to damage these legumes and infestations were heavy in many areas; however, activity was generally not as great as in the first year. Seasonal conditions were generally less favourable for their multiplication.

A disturbing feature was the development, in the Tamworth district, of significant resistance by the spotted alfalfa aphid to a variety of insecticides. The chemical chlorpyrifos proved to be an effective control, but should only be used where resistance to currently used materials is confirmed.

New Pasture Plants

Newly available pasture plants, apart from the lucernes, include: Northam, Nungarin and Trikkala subterranean clovers (all low in oestrogens).

Natural Pastures

The State's 15 million ha of natural pastures, although heavily grazed, produced abundant feed. Plenty of dry herbage remained as a carry-over feed reserve.

Improved Natural Pastures

With the better economic climate, improved natural pastures containing adapted pasture legumes were again being topdressed with superphosphate. This, together with the better seasonal conditions and the reduction in livestock numbers, tended to reverse the trend of declining productivity that has featured in recent years.

Sown Pastures

The area of sown pastures, both dryland and irrigated, remained relatively static. An important change was the upsurge in the use of superphosphate, together with a swing back to more persistent recommended varieties.

Pasture Pests

Until March, outbreaks of the Australian plague locust (*Chortoicetes terminifera*) were restricted to the Central Division. Favourable weather in April resulted in long-distance night flights, and infestations caused damage to pastures on the slopes and nearby plains. Intense egg-laying occurred in these areas, creating a potentially severe threat of heavy spring infestations and damage to pastures extending from the Queensland to Victorian borders. On the other hand, wingless grasshopper (*Phaulacridium vittatum*) predations were not as severe as in the past three years. Their effect in reducing pasture production was again substantial in some areas of the tablelands. In spring, larvae of the African black beetle (*Heteronychus arator*) damaged pastures along the coast. Damage was severe where outbreaks occurred with below-average rainfall, especially where pastures were overstocked.

Fodder Conservation

Early estimates indicate that the steady decline in hay and silage reserves over the past five years may have levelled off. A major contributing factor to the lowering of reserves of these feeds has been the swing to grains, which are generally less costly to handle. Other factors were a succession of less favourable seasons, and the effects of insect pests.

Fertilizer Application to Pastures and Lucerne

Higher livestock commodity prices continued to encourage farmers to use more fertilizer. The amount of superphosphate used on pastures in 1978-9 was 25 per cent greater than the amount used in 1977-8. The greatest increase occurred in aerial seeding and topdressing operations. The area treated and quantity of fertilizer spread increased by 46 per cent and 53 per cent to 2 160 000 ha and 234 000 t, respectively.

New problems have arisen from the reduction in the productivity of improved pastures because of the development of the soil acidity complex, particularly on the central tablelands, southern tablelands and southern slopes. The use of lime to overcome the difficulty is becoming increasingly important.

Nitrogen fertilizer continued to be used primarily on irrigated dairy pastures for winter feed production, while the use of potassium fertilizers steadily increased on the central and south coasts and in the lower Hunter Region.

IRRIGATION

The above-average evaporation for much of January and February caused substantial stress on the supply capabilities of river pumps and channels in Irrigation Areas and Districts. This lengthened the interval between irrigations, and moisture stress caused low yields during the early grain development stage.

The problem of the large amount of labour required to supervise surface irrigation was tackled by substantially raising the application rate of water to the field. Experiments demonstrated that it was possible for one large outlet to irrigate in excess of twenty furrows, thus eliminating the need for supervision of single furrow syphons.

The fitting of laser beam controls to earth-moving machines achieved a much greater uniformity in the slope of the land. This improvement was reflected in higher crop yields.

SEED PRODUCTION

The large increase in seed production, compared with the previous three years, was due to three major factors: the previous season had produced a very poor harvest, so stocks of seed were low; the good spring rainfall of 1978, and the recovery of the grazing industries, led to a big increase in demand; and prices to the grower were generally good for most varieties throughout the season.

The foundations now exist for a high level of production of pasture seed next season. Most of the seed from the last harvest was sold, so stocks are again low. Prices are still attractive to the grower, and there has been a good start to the season.

HORTICULTURE

CITRUS

Seasonal conditions were generally favourable and the final crop estimate for all main citrus types was 216 939 tonnes, slightly above the previous year's 213 000 tonnes. The area planted increased by 67 ha to 11 787 ha, following major annual declines in plantings since 1974. Coastal districts plantings continued to decline, Murray districts remained stable, and the M.I.A. increased by 251 ha (mainly Valencias).

Following a major field day at Yanco Research Station in 1979 on citrus dwarfing, growers, particularly in the M.I.A., showed great interest in dwarfing as a means of establishing new high-density citrus plantings.

Production and planted areas of citrus, 1978-9

	Production* (t)	Planted area in 1978 (ha)		
		Bearing	Non-bearing	Total
Navels	61 314	3 316	148	3 464
Valencias	120 023	5 377	798	6 175
Common oranges	321	38	1	39
Lemons and limes	18 116	970	124	1 094
Mandarins and hybrids	6 389	521	11	532
Grapefruit	10 649	385	80	465
Seville and others	127	18	..	18
All citrus	216 939	10 625	1 162	11 787

* Final estimate, May 1979.

The F.I.S.C.C. increased the minimum price for most processing citrus fruits (fruit delivered to country factories) in the 1978-9 season. Navels were \$74 per tonne (an increase of \$11); Valencias, \$86 (an increase of \$10); lemons, \$99 (an increase of \$5); while grapefruit remained unaltered at \$78 per tonne. The strong demand for Valencias by processors continued but there were some processing surpluses of navels, grapefruit and lemons, caused by the level of the fresh-fruit market prices and demand. Some fruits, particularly lemons, were not harvested. Small quantities of citrus were again exported, mainly from the Murray districts.

Following T.A.A. and I.A.C. inquiries, the Federal Government announced a variable tariff to protect the Australian citrus industry against imports of orange and mandarin juice for the next three years. This decision was welcomed by growers, as it will bring some stability to the industry and permit adjustment to take place, but it is unlikely to encourage expansion of new orange plantings in most districts. Importation of these juices declined by almost 60 per cent since the peak imports of 1975-6.

Pests and diseases were generally at a low level. Red scale (*Aonidiella aurantii*) populations increased significantly in all inland districts due to the summer heatwave conditions, which favoured the scale. These same conditions, however, reduced the populations of the red-scale predator wasps (*Aphytis melinus*, *Comperiella bifasciata*) where biological control was used.

GRAPES

Good growing conditions were generally experienced, although rain prevented normal application of lime sulphur sprays in many instances. October frosts caused extensive damage in the Bilbul-Yenda area as well as in some other M.I.A. districts, at Jerilderie and Mudgee, and later at Pokolbin. Flowering and fruit set indicated heavy crop potential.

Extreme January heat scorched bunches, reduced crops and increased table grape trimming. Acid levels in wine grapes tended to drop and reduced colour intensity was reported. Rain affected late-maturing currant crops.

Subsequent rainfall at the beginning of the main harvest caused considerable splitting, heavy drop and mould. Raisins came off under better conditions and were mainly three or four crown. World shortages of dried grapes ensured the satisfactory disposal of all sultanas, despite their lower quality.

The February rain curtailed fresh-fruit marketing of sultanas and also affected Ohanez, which later showed some poor out-turns on export to South-East Asia. Otherwise, table grapes had a reasonable season, bringing generally good prices.

A very substantial tonnage of Shiraz grapes was picked at low Baume for white wine. This alleviated the surplus situation and virtually no red grapes were unpicked except for 2 000 t in the Hunter Valley. Record tonnages were crushed in the M.I.A. and Hunter Valley (85 850 t and 23 415 t). Mudgee produced 1 400 t, and Berrigan and Corowa vineyards about 2 300 t. It was generally considered to be a very good year for wine-making. Planting statistics revealed little change, although 222 ha of Shiraz and 24 ha of Cabernet Sauvignon were removed in the Hunter Valley. Mechanical harvesting and mechanical pruning techniques continued to be used to reduce costs.

POME FRUITS

Persistent dry and hot weather from mid-summer caused a reduction in size of mid-season fruit. Widespread hail damage occurred at Camden. Prospects improved following good rain in March, although the final forecast was for a heavy apple crop of 103 364 t and a moderate pear crop of 12 118 t. Maturity was about ten days later than the previous year. Apple prices were high during the latter half of 1978, with selected lines of Delicious reaching \$25 per carton.

By contrast, prices to the end of June for the heavy 1979 crop were unsatisfactory, but prices for the moderate pear crop were better. Exports of apples in 1978 were very small, at 346 t. The tonnage of pears exported, 2 332 t, was the highest for a number of years.

The areas planted with apples and pears appeared to stabilize at 5 279 ha and 891 ha respectively, after falling for a number of years. Despite the decrease in area, production has not fallen because of improved cultural techniques. Cool storage capacity continued to increase, with most interest being centred on controlled atmosphere storage. There were 232 operators with 2 510 260 cartons of regular cool storage space, and 53 operators with 1 920 800 cartons of controlled atmosphere space. The Department distributed 2 500 MM106 virus-tested rootstocks to nursery people and growers for multiplication as part of the New South Wales Pome Fruits Improvement Scheme. A collection of virus-tested scion varieties was assembled in a multiplication unit and will be increased, with the objective of providing the industry with recommended propagation material.

STONE FRUITS

Crops matured approximately fourteen days late and were much heavier than those of 1977-8, despite unfavourable weather at blossoming. Ideal weather during the harvest resulted in a record crop of 5 939 t of cherries (over a million cartons). Prices were good, with improved demand from processors and exporters. Growers at Orange adopted field-dipping into polyethylene-lined bins containing brining mixture. High returns were received for dessert peaches (13 400 t) and nectarines (2 600 t), despite the 25 per cent increase in production. January heatwaves affected nectarines, while hail in December damaged stone fruit near Camden.

Despite dry conditions at Young and low soluble solids in the M.I.A., prune production in these areas reached 3 914 t and 1 350 t, respectively, the heaviest yield for several years. Three new shake/catch harvesting machines commenced operation. The 12 564 t M.I.A. canning peach crop, including 2 063 t processed in Queensland, was only 225 t less than that of 1978. Despite a dry season, most growers had good crops and little wastage. Canning apricot crops, at 5 423 t, were the heaviest for many years and more than double that of last year. Dessert apricot crops at Kurrajong were extremely light. The 4 000 t crop of Japanese plums was more than double that of the previous year, despite heavy losses in Sydney districts caused by the January heatwave. The European plum crop of 1 700 t was similar to that of 1977-8.

Sclerotinia laxa was identified for the first time in the M.I.A. Strawberry growers suffered heavy losses from fruit rots during the wet spring, and damage in the January heatwave. Poor prices in November accompanied the large volume of local and interstate fruit. Total plantings of stone, berry and miscellaneous fruits declined by 288 ha to 6 532 ha, due partly to accumulated drought losses in the Young district, wet weather losses and M.I.A. tree removals.

TROPICAL FRUITS

After steadily declining from a peak of 12 138 ha in 1960, there was a slight rise in banana plantings last year, and a further small rise this year—a net increase of 124 ha to 6 706 ha. Oversupply is forecast for next year. Bunchy top disease was reduced to its lowest level (1 126 plants) for six years, due to a policy of destroying chronically infected areas. A State Government grant of \$20,000 annually for three years, matched with \$10,000 annually from the banana industry, will greatly facilitate this eradication programme. Increasing incidence of banana weevil borer in the Coffs Harbour and Macksville districts caused concern, but the industry-funded survey and control scheme operated effectively. Trials commenced with the cluster-packing of bananas in fibreboard packages that are designed for efficient horizontal forced-air cooling. If successful, this packaging may replace single-packed bananas in wooden boxes.

Interest in custard apples, guavas, lychees and avocados increased. An avocado phytophthora prevention scheme was initiated: it grants accreditation to nurseries adopting strict hygiene standards and where soil tests show freedom from disease. Research has begun into more efficient control of monolepta beetles. The opening of a processing factory at Murwillumbah stimulated interest in passionfruit and the area under that crop rose to 66 ha. The same factory also intends to process guavas. A passionfruit scionwood accreditation scheme, established jointly by the industry and the Department, ensures that nurserymen can produce plants free of chronic forms of woodiness virus, and with good yielding and quality characteristics.

NUTS

The area of macadamias rose by 270 ha to 970 ha and further expansion will occur, especially in the Lismore area. Production of pecan nuts reached 450 t in the Moree district. Interest in the production of almonds, walnuts, chestnuts, pistachios and filberts continued.

VEGETABLES

The main seasonal features were the cool spring/early summer weather, heatwave conditions during mid-summer, and the lack of rain during summer/autumn on potato crops in the central and southern tablelands.

Asparagus

Fewer losses through flooding, and a better supply of harvest labour, resulted in increased supplies to the fresh market from local sources. Substantial quantities of canned asparagus were again imported. For 1977-8, the bearing area of 1 044 ha produced 3 430 000 kg.

Green Beans

Growers on the far north coast completed picking of the winter crop in November, with an average yield of 5 000 kg/ha. Cool weather and low soil temperatures in other coastal areas delayed crop establishment and reduced production early in the season. Larger plantings were established later in the year. Sowing of inland processing crops commenced during October/November, but heatwave conditions in January seriously affected flowering and pod set. In 1977-8 the green bean crop totalled 4 748 678 kg for processing and the fresh market, from an area of 1 425 ha.

Cole Crops

Supplies of cabbage and cauliflower were in excess of demand on several occasions and prices for cabbage were particularly low in the last quarter of the year. Broccoli plantings kept pace with the increasing demand. For 1977-8, 727 ha of cabbage produced 12 666 t and 730 ha of cauliflower produced 16 840 t.

Cucurbits

Production was comparable to levels of previous years. There was an increase of mosaic disease in zucchini, especially on the north coast. Rockmelon production was greater than the previous record levels of 1977-8, when 729 ha produced 8 686 t.

Onions

The level of production was similar to that in 1977-8, when 839 ha produced 23 767 t. Mechanical harvesters were used for the first time on a significant scale. Substantial quantities of early onions in storage at Griffith were lost due to rots.

Potatoes

Plantings and production again declined in tableland districts and increased in the South West Region. Drought conditions prevailed in the central and southern tablelands, and greatly reduced certified seed production. Market prices were relatively high for most of the year. More centre-pivot irrigation systems were installed. Production in 1977-8 was 115 000 t from 8 694 ha.

Tomatoes

Production from fresh market crops was greater than in 1977-8, when 957 ha produced 12 239 t. Prices were low during the last three months of the year. Plantings for processing were about normal, but the Finley area suffered severely from a heatwave in January and production will be less than last year, when 34 000 t were harvested from 1 250 ha.

ANIMAL INDUSTRIES

SHEEP AND WOOL

For the first time in many years, sheep and wool producers in New South Wales experienced the welcome combination of a good season and good prices.

The profitability of sheep increased at a greater rate during 1978-9 than did production costs. This allowed producers to re-invest in property maintenance and provided a strong incentive for them to rebuild their flocks.

The severe drought over the southern half of the State was broken by widespread winter rains which continued into the spring. These good rains were received over the whole of New South Wales, benefiting all sheep-producing areas and culminating in an extremely good season. However, the combined effects of bushfires, grasshoppers and insufficient follow-up rain during the early autumn created an autumn feed shortage in many districts. Drought conditions prevailed in some districts, particularly in the north west. By the winter of 1979, most districts were again in a very sound position.

Sheep numbers have declined from 72 million in 1970 to 48 million in 1978, but rose slightly to 48.4 million in 1979.

The size of the State's adult Merino ewe flock is the key to the rate of any future expansion in sheep production. No significant long-term improvement can occur until the Merino flocks have been rebuilt. During 1978-9 the number of ewes joined to Merino rams fell by nearly 10 per cent.

A continuing demand for mutton, the rising wool prices and a general shortage of sheep created a very high price structure for all classes of sheep. The recent strong demand for Merino rams indicated that producers were keen to consolidate and expand their Merino flocks. These economic incentives to increase sheep numbers, combined with decreased slaughtering of grown sheep and an above-average lamb-marking percentage of 80.2 per cent for 1978-9, were strong indicators that the sheep population of New South Wales will expand significantly during the next few years.

Wool production improved during the year, with wool cut at 4.4 kg per head (5.4 per cent higher than in 1977-8) and yielding 223.7 million kg.

The Australian Wool Corporation (A.W.C.) maintained the minimum floor price for the market indicator wools at 298c/kg greasy, but during the season the auction value of these wools advanced to 371c/kg greasy in March, 1979, and finished the season at 362c/kg greasy. In supporting the minimum floor price, the A.W.C. purchased considerably less wool than in previous seasons and at the same time was able to reduce its stocks from 930 612 bales in June, 1978, to 365 194 bales in June, 1979.

Seasonal conditions during 1978-9 were favourable for prime lamb production. Although fewer ewes were joined, the combination of excellent lambings and good growth rates enabled the industry to slightly expand production to 90 800 t.

However, mutton production declined from 78 000 t in 1977-8 to 68 100 t in 1978-9. This was because of the greatly reduced number of sheep available for slaughter.

Slaughterings

	1977-78	1978-79
Sheep	4 024 000	3 484 000
Lambs	5 202 000	5 285 000

The demand by Middle East countries for live sheep for slaughter continued. During 1978-9, some 5 million live sheep were exported from Australia, and of these about a quarter were from New South Wales.

In recent years, producers endeavoured to reduce production costs. With the advent of higher returns, producers were again spending money on pasture improvement.

BEEF CATTLE

The beef herd "sell off", which commenced in 1974 in response to low prices, continued through into 1978 when large increases in prices over an extended period further accelerated the marketing rate. Prices for export beef were particularly strong, and cattle breeders were unable to compete with meat operators for female stock.

The female portion of cattle slaughtered was maintained at or above the 50 per cent level for most months of the year. The effect was to reduce the State herd size from the peak of 9 million in 1976 to just over an estimated 6 million head at the end of March 1979. Early in 1979, the slaughter rate declined as fewer cattle became available for market. To June 1979, the estimated total slaughter of 2.9 million head of adult cattle was 9 per cent below the June 1978 figure of 3.2 million head. Calf slaughter in the same period fell by 32 per cent indicating a continuation of the reduction in dairy herd size and the retention of calves in beef herds.

The improved profitability of beef production resulted in the reduction of applications for assistance under the Rural Assistance Scheme. Notable increases occurred in expenditure on fertilizer and fencing, both of which were neglected during the slump period.

Favourable seasonal conditions in most areas of the State contributed to greater stability in the industry. Good market prices for wool and for sheep meats restrained producers from changing into beef, as happened in the early 1970's boom. The effect of well-sustained high prices for beef on specialist beef producers was to increase the value of the base herd and to make herd expansion difficult under the existing cost structure.

Consumer resistance and the consequent reduction in beef consumption in Australia, plus the effect of overseas industrial and political changes, could cause problems with maintaining on-farm profitability. The profitability of abattoir operation was eroded by the reduction in the number of cattle and calves slaughtered. The daily through-put of New South Wales abattoirs fell from 16 000 in June, 1978, to 8 900 in June, 1979, with predicted falls to 7 000 or less per day for the last quarter of 1979.

The general good health status of New South Wales beef herds was maintained. Progress with eradication of brucellosis was such that New South Wales will reach provisional freedom status by the target date for the National Brucellosis Eradication Campaign. There will remain, of course, the problems of final eradication.

PIGS

Pig numbers and pigmeat production decreased due to high capital and production costs. Preliminary figures indicate that the State's pig population fell by 8 per cent from 739 000 in 1978 to 679 547 in 1979. In the year ending June, 1979, pigmeat production was 54 170 t, 1.2 per cent lower than the previous year. Sow numbers have decreased by 11 per cent over the past two years. However, a trend towards the production of heavier market-weight pigs limited the effect of this drop in sow numbers.

Saleyard prices for all classes of pigs rose steadily. The usual seasonal fluctuations over the Christmas period were smaller than in previous years.

Feed costs and supplies remained relatively stable through 1978 and into early 1979. However, in March 1979, feed costs began to rise in response to an increase in the price of protein concentrates.

National per capita consumption of pigmeat increased by 0.9 kg to 13.4 kg during 1978. The major reason for the rise was the increased competitiveness of pigmeat compared with beef and sheep meats. Extensive promotion campaigns by small goods manufacturers also influenced consumption.

POULTRY

Egg Production

The full effects of the Egg Industry Stabilization Act (1974) were evident in the 6 per cent reduction in egg production in 1978-9, compared to the previous year.

A reduction in the State hen quota in October, 1978, stimulated demand and resulted in prices rising to \$13.50 per hen. An announcement of the Government's intention to control the price of hen quotas led to an initial reduction in price to \$9.50 per hen. The Poultry Advisory Board is at present preparing a proposal on price control on hen quotas for the Minister's consideration.

Seasonality of egg production, coupled with a general decline in egg size, caused marketing difficulties.

The price of manufactured poultry feeds increased due to increases in cost of grains, protein meals and labour. The price of medium-energy layer feed is now \$140 a tonne.

The price of eggs increased during the year, as the Egg Marketing Board sought to cover increases in costs of production.

A number of new strains of poultry have been developed and released by local breeders. Mortality rates and egg size were a problem with some of these strains. A new strain, producing brown-shelled eggs, is creating interest among producers.

Poultry Meat Production

This section of the poultry industry experienced similar increased production costs to those of the egg section. The relatively high price of red meat during the year stimulated demand for all types of poultry meat, especially chicken.

Extremely high February temperatures caused increased mortality rates in breeder flocks and led to a shortage of day-old meat chickens.

The Chicken Meat Industry Committee, established under the Chicken Meat Industry Act (1977), is working towards guidelines that will apply to agreements between broiler processors and broiler growers. In June 1979, the average return growing fee to contract broiler growers was 18.66c per chicken, before grower costs were deducted.

Turkeys and ducks were also in strong demand, but the supply of stock was limited. Pheasant and quail production increased due to an influx of small-scale producers.

HONEY

Honey production was about average and those beekeepers who migrated their hives to advantage obtained satisfactory yields. Most honey was from ground flora. This produces a good-quality honey which is eagerly sought on world markets.

Diseases affecting bees were more common. American foul brood disease (*Bacillus larvae*) was more prevalent than during the previous season and European foul brood disease (*Streptococcus pluton*), although mainly confined to the southern areas of New South Wales, affected ten apiaries outside the proclaimed quarantine area. The number of hives affected by virus diseases was unusually high.

DAIRYING

SEASONAL CONDITIONS

Apart from the late summer period, conditions for dairy production were particularly favourable and overall the season was one of the best for some time.

Following the prolonged rains in autumn 1978 and flooding in most districts, conditions improved during the winter. Dry, sunny conditions prevailed over most of the State, day temperatures were mild and the few frosts that occurred were light.

All districts reported a good spring and early summer, with evenly distributed rain and ideal growing conditions. The abundance of green feed allowed hay reserves to be built up in most areas. In all areas the need for concentrated feeding during this period was reduced. In the south-western areas of the State most dairymen entered the summer months with adequate reserves of irrigation water.

Conditions deteriorated in mid-summer when hot, dry weather set in. Extremely high temperatures of up to 40° C were recorded throughout the State and persisted for about two weeks. As a result of the lack of rain and the extreme heat, drought conditions developed in some areas, such as the Windsor district, where the only source of green feed was irrigated crops and pastures. As a result, summer production did not reach its potential in many districts. However, the weather improved markedly in the autumn, when good rains fell. Favourable conditions continued into the winter.

Farms

The number of registered dairymen in New South Wales fell to 3 874 at 30th June, 1979, which is equivalent to a fall of a little over 5 per cent.

Factories

Factories generally had a good year, with demand for their products exceeding production. However, five dairy produce factories ceased operation during 1978-9. Of these, four closed as a result of rationalization of their activities, and the other, a manufacturer of fancy cheese, closed because of marketing difficulties.

Pollution control requirements made it necessary for many factories to construct waste-treatment plants.

All dairy product factories introduced a seasonal incentive payment scheme as a means of boosting manufacturing milk production. Prices offered were higher than last year and averaged over \$2.00/kg butterfat. One factory called tenders for the purchase of its surplus milk, and met keen demand at a satisfactory price.

Where possible, factories moved away from the manufacture of low-return leviable products into the quick-return, higher profit lines.

Market demand for fresh cheeses such as the California-style cottage cheese allowed another major city milk company to enter this field.

There was an increasing usage of frozen starter concentrates by most cheese manufacturers, mainly because they are convenient to use.

Cheese factories showed interest in using low-heat skim milk powder as a means of utilizing surplus fat or extending the present milk supply and increasing cheese yields.

PRODUCTION

Milk

Milk production declined slightly during the year. Over 62 per cent of total production was utilized as market milk by the Dairy Industry Authority (D.I.A.). Production levels for the last five years were as follows:

New South Wales milk production ('000 000 L)*

Year								Total	D.I.A. milk	Manufacturing milk
1974-5	..	..	..	..	..	..	..	958	552	406
1975-6	..	..	..	..	..	..	..	980	552	428
1976-7	..	..	..	..	..	..	..	943	569	374
1977-8	..	..	..	..	..	..	..	890	547	343
1978-9	..	..	..	..	..	..	..	885	551	334

*Source: A.B.S. Statistics.

Butter

Butter production remained steady at 4 000 t and, because of low quality, about 40 per cent of this was unavailable for table use. Victorian factories now supply some 85 per cent of the New South Wales table butter requirement, most of which is packed ready for retail distribution.

Cheese

Cheddar cheese production increased by more than 5 per cent to 6 800 t, reflecting a continued demand for both mild and mature cheese. Additional supplies of cheese were obtained from interstate manufacturers to supplement shortfalls.

Processed cheese production increased by 15 per cent to 2 288 t, following a similar increase in 1977-8.

Strong market demand for non-cheddar cheese varieties resulted in an 18 per cent increase to a total of over 5 500 t. Cottage cheese, cream cheese, Feta, Ricotta and the pasta filata varieties (such as Mozzarella) accounted for more than 80 per cent of the non-cheddar production.

Other Dairy Products

Yoghurt production increased by a further 16 per cent to more than 14 000 t. Production of leviabile dried milk products declined slightly, reflecting a gradual change to more lucrative product mixes.

RESEARCH

RESEARCH ADMINISTRATION

New South Wales is divided into 5 regions for the administration of research. The regions and the research units based in them are shown in Figure 1. The Regional Veterinary Laboratories and the central laboratories at Rydalmere are not included in a regional directorate nor are the Veterinary Research Station, Glenfield, the Dairy Research Centre, Richmond or the National Herbarium.

Each region is administered by a Regional Director of Research. In addition, a Director of Research is located at Trangie and Supervisors of Research at Glen Innes, Gosford, Grafton and Condobolin Research Stations.

To meet State responsibilities, research is co-ordinated by research directors located with the Divisions in Sydney. At executive level, the Assistant Director-General is responsible for the overall management and control of the Department's research activities.

Fig. 1. REGIONS AND RESEARCH UNITS

North and Central Coast

- 1 Alstonville: Tropical Fruit Research Station
- 2 Lismore: Board of Tick Control*
- 3 **Wollongbar: Agricultural Research Centre**
District Veterinary Laboratory*
- 4 Duck Creek: Sub-Station of Wollongbar Agricultural Research Centre
- 5 Grafton: Agricultural Research Station
- 6 Taree: Agronomy Research Unit
- 7 Gosford: Horticultural Research Station
Horticultural Post-Harvest Laboratory

North and North Western

- 8 Glen Innes: Agricultural Research Station
- 9 Shannon Vale: Sub-Station of Glen Innes Agricultural Research Station
- 10 Narrabri: Agricultural Research Station

- 11 Armidale: Animal Breeding and Genetics Unit†
District Veterinary Laboratory*
- 12 **Tamworth: Agricultural Research Centre**
- 13 Breeza: Sub-Station of Tamworth Agricultural Research Centre
- 14 Scone: Agronomy Research Unit

Central Western

- 15 Trangie: Agricultural Research Station
- 16 Condoblin: Agricultural Research Station
- 17 **Orange: Agricultural Research Centre**
- 18 Bathurst: Agricultural Research Station
- 19 Richmond: Horticultural Research Unit
- 20 Seven Hills: Poultry Research Station

South and South Eastern

- 21 Cowra: Agricultural Research Station
- 22 Temora: Agricultural Research Station

- 23 **Berry: Pasture Research Unit**
- 24 **Wagga: Agricultural Research Institute**
District Veterinary Laboratory*
- 25 Canberra: Agronomy Research Unit

South Western

- 26 Dareton: Horticultural Research Station
- 27 Griffith: Viticultural Research Station
- 28 Leeton: Agricultural Research Station
- 29 **Yanco: Agricultural Research Centre**

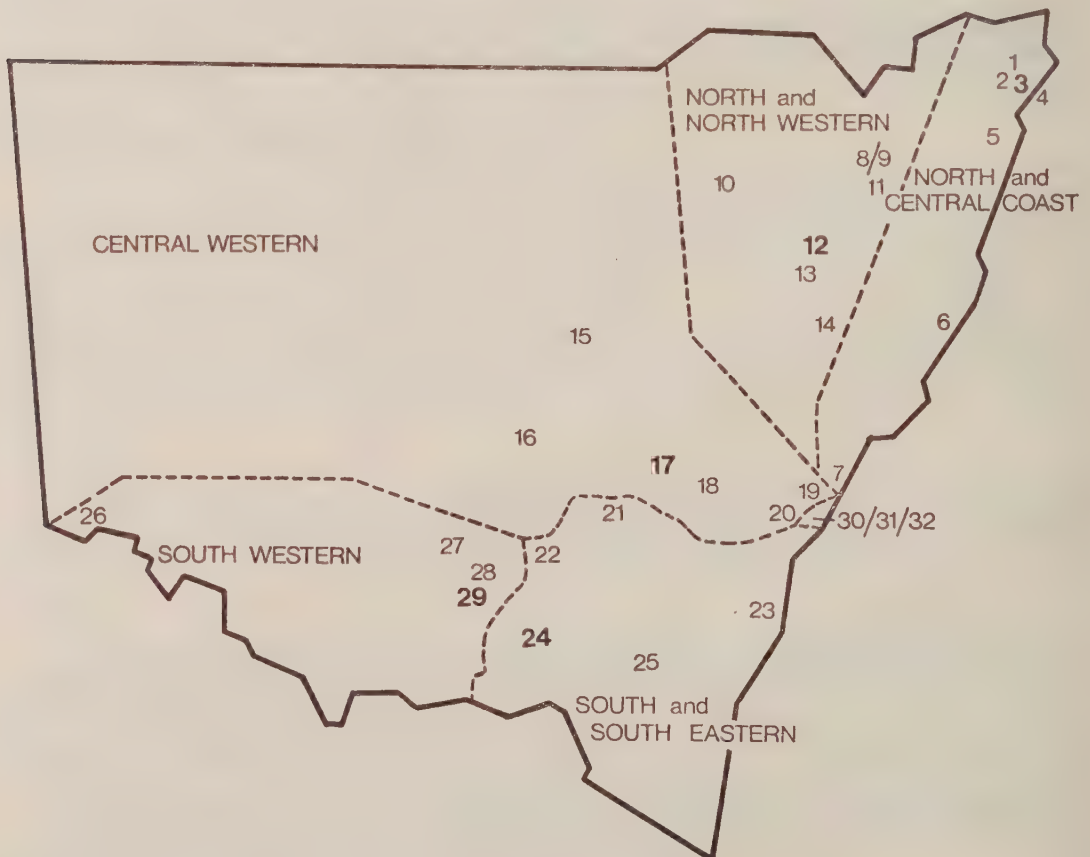
Other Laboratories

- 30 Rydalmere: Biological and Chemical Research Institute
- 31 Glenfield: Veterinary Research Station*
Agricultural Engineering Centre
Noxious and Feral Animal Research Centre†
- 32 Richmond: Dairy Research Centre†

Items in bold type denote administrative centres.

* Administered by the Division of Animal Health.

† Administered by the Division of Animal Production.



CROPS AND CROP PRODUCTS

FIBRES AND OILS

Cotton

Carbon production and partition in cotton plants is being studied in glasshouse experiments to elucidate the partition of assimilates in response to nitrogen level and irrigation frequency.

Rapeseed

An overseas study tour by the rapeseed breeder has led to a better exchange of information and breeding material. Thirteen promising blackleg-resistant crossbreds have been identified, and two are being evaluated for possible release. Single plant selections, which combine low erucic acid and resistance to blackleg are being evaluated in field plots while others combining blackleg resistance, low erucic acid and low glucosinolate levels have been obtained.

Soybeans

All aspects of the breeding programme made progress with fresh impetus from a visit by the breeder to American soybean research centres and international conferences. The release of a replacement variety for Bragg is proposed for 1980. On the far north coast, Fitzroy showed better tolerance to harvest weathering and acid soils than currently available varieties.

Research at Leeton has shown that solid and liquid forms of inoculant, introduced separately into the seedbed, are satisfactory alternatives to direct seed inoculation.

At Trangie, soybeans did not respond to superphosphate despite low P levels in the soil. Large responses to zinc occurred on alkaline clay soils. There was a variety x zinc effect, with Lee failing to respond but Bragg, Forrest and Dodds giving large responses.

GRAIN LEGUMES

Chickpeas

At Wagga, an understanding has been gained of the inheritance of seed type in chickpeas. Heritable and consistent differences in resistance to *Heliothis* larvae were observed between chickpea genotypes. The F₃ stage of the breeding programme was successfully completed, with selection being made for acceptable height, maturity and seed size. At Trangie it was found that the culinary chickpea line, CPI 56563, has the best potential for yield and seed size and tests indicate that it is suitable for canning.

Lupins

In southern New South Wales an average yield of 2.3 t/ha was obtained over seven trial sites. *Lupinus albus* cv. Ultra yielded over 4 t/ha at Cowra, but this high protein variety did not yield as well as *L. angustifolius* varieties when late sown in poorly drained soils. Under irrigation, in a cool wet season, all lupin varieties were stunted and yields were depressed, with *L. albus* varieties worst affected.

Other grain legumes

Adzuki beans were found to be poorly adapted to dryland cultivation in the north-west but were promising as an alternate crop to soybeans on the north coast. Some selections of pigeon peas show promise.

SUMMER CEREALS

Rice

The long-grained selections, YR303D-1 and YR303D-5, performed well for the second successive year. Studies indicate that dwarf rices, which respond to very high nitrogen applications without lodging, may be useful.

Investigations of flower sterility caused by low night temperatures showed that raising the water level in rice bays helps protect the developing panicle.

A comparison of nitrogen fertilizers indicated no advantage of sulphur coated urea over conventional N sources. Delaying the application of either urea or sulphate of ammonia until panicle initiation reduced early vegetative growth and tiller formation, but increased grain yield of Inga.

Sorghum

Sorghum showed significant yield responses to applied phosphorus on shallow top soils when subject to moisture stress. Generally, vegetative growth responded to nitrogen, but moisture stress at grain filling usually prevented a yield response.

Maize

Newly synthesized mid-season, single-cross and three-way cross hybrids are showing promise. Inbreeding and selection continued with a large number of unfixed lines, most of which originated from single crosses and backcrosses of elite mid-season lines with high yield and resistance to northern leaf blight. The opaque-2 gene is being incorporated into selected lines to increase the lysine content of the grain.

WINTER CEREALS

Wheat Breeding

Record dryland yields, approaching 7 tonnes/ha, were recorded in the 1978 crop from the variety Egret. Such production was previously not considered possible in Australia.

Promising new lines maintained a high level of performance. WW179, agronomically similar to Egret, but having better stem rust resistance, is being seed increased.

Many triticales are immune to infection by *Mycosphaerella graminicola* (*Septoria triticii*). A crossing programme at Wagga designed to incorporate specific rye chromosomes from resistant triticales with commercial wheats is going well. A successful glasshouse screening for resistance to *M. graminicola* has been achieved.

The programme at Tamworth to produce a frost resistant variety has been expanded. Trials have identified lines of moderate frost resistance of possible commercial use. Evaluation of varieties using a freezing chamber is being undertaken in an attempt to demonstrate that genetic variation exists in the effectiveness of both freezing pathways, i.e., through the rachis or through inoculation by hoar frost in the glumes.

Investigations on drought tolerance at Tamworth found that water deficits have the same effect on the number of grains per ear, whether applied at meiosis or during booting stages, that they reduce pollen viability rather than ovule fertility, and are not significant until leaf water potentials reach about -2.0 MPa.

Durum wheat production is expected to expand four-fold in 1979, based on the improved yield potential and quality of the new variety Durati. Breeding materials entering initial yield trials this season have semolina pigment levels from 20 to 50 per cent over that of Durati.

Barley

Cutter, a variety with attractive grain and good performance in northern areas, is being seed increased prior to release.

Oats

A new dual purpose crossbred is being seed increased for release to registered growers for 1980 sowings. Large differences in the susceptibility of varieties to smut races have been found.

Agronomy

In addition to the many other significant benefits from direct drilling, actual increases in yield ranging from 12-36 per cent, over conventional cultivation were recorded in trials on the southern slopes.

Research in northern areas has confirmed that wheat yields are decreased by about 10 per cent when row spacing is increased 18 to 36 cm, a finding relevant to the design of seeders for use in stubble farming.

Studies on sod-seeding wheat into rice stubble show that increasing amounts of rice stubble and increasing rates of nitrogen fertilizer reduce plant establishment.

Analysis of a three-year growth and water use study of wheat at Tamworth has indicated that crop evapotranspiration to anthesis, but not to maturity, was increased slightly by higher seeding density, but was not consistently affected by sowing date.

Analyses of fertilizer rate experiments with wheat have given relationships explaining 50 per cent of the variation of potential yields at different sites. Using these relationships the way wheat responds to phosphorus on a given site can be estimated by defining the site characteristics.

PASTURE RESEARCH

Species Breeding

The lucerne breeding programme at Yanco has developed Australia's first variety highly resistant to spotted alfalfa aphids. It retains the desirable characteristics of Falkiner, the variety from which it is derived.

A new red clover, Redquin, was released during the year.

Species Evaluation

American aphid-resistant lucerne varieties performed well in statewide trials. The winter-active varieties have been the highest yielders under both dryland and irrigated conditions. Grazed by sheep to stimulate local management, all varieties, including winter-active types, survived well despite a dry summer. Several varieties showed good resistance to one or more important diseases.

In sprayed and unsprayed comparisons at Tamworth the effect of the aphids on annual medics and other annual pasture species has been investigated both in pure stands and in mixed pastures. The effects were generally greater in the pure stands and there were very substantial species and varietal differences.

Results from a project to evaluate annual legumes in the south-west wheat belt include (i) the recommendation of Northam sub clover in the 400–450 mm rainfall zone, (ii) evidence of the worth of Daliak and Seaton Park as replacements for the highly oestrogenic Dwalganup in the 425–475 mm and 450–550 mm zones and (iii) the recommendation of Trikkala as an alternative to the highly oestrogenic Yarloop.

At Glen Innes, pure swards of individual native grasses have been established for seed production and to study regeneration. Studies at Tamworth have shown the high grazing value of *Danthonia linkii* and *Stipa variabilis* and the low value of *Aristida ramosa*, seeds of which cause contamination in wool and sheep carcasses.

Establishment

Two new insecticides have proved effective in reducing ant theft of aerially sown seeds.

The morphology of grass seedlings has been found to respond to surface sowing, nodal root extension being delayed by surface dryness. Establishment techniques are required which enhance the water environment of the seed at the critical times for nodal root development.

Investigation of lucerne seeding rates in the Hunter Valley has shown that, after one year, total yield was not affected by rates from 2.5 to 25 kg/ha.

Nutrition

The nutritional problems of plants growing in acid soils continued to be studied at Wagga in field trials and the glasshouse and in field trials initiated on the southern tablelands.

At Glen Innes, the project on sulphur use in pastures has shown how fertilizer costs can be reduced by using elemental sulphur or sulphur fortified superphosphate. On the southern tablelands release of sulphur from fertilizers has proved to be slow, taking at least 2 years before a significant response occurs.

Study of the nutritional requirements of legume pastures in the central-west has shown that they have no major problem at present.

South coast trials have shown some strong positive interactions between superphosphate and potash.

PRODUCTION AND MANAGEMENT

Experiments have been conducted at Wollongbar to define the effects of light and temperature on the growth and quality of kikuyu grass. The results showed that growth was rarely limited by light at low night temperatures, but with warmer nights, it was reduced by over 30 per cent, when irradiance was reduced by 24 per cent. None of the light and temperature treatments had an important effect on the digestibility of kikuyu grass.

A pasture growth/animal production model has been developed from analysis of a number of stocking rate experiments. Within experiments, the model explains between 70 and 90 per cent of the variation in animal performance.

FORAGE CROPS

At Trangie, irrigated summer forages have proved to be highly productive. Quality was low in some species.

Grown for winter grazing and spring grain recovery, to reduce the dependence of dairy farmers on purchased grain, wheat, barley, triticale, oats and rye all yielded well in trials at Taree.

WWB 18 barley and Isis wheat were outstanding for winter forage production and grain recovery at Trangie.

Grown for forage on the north coast, lupins, *Lupinus luteus*, Weiko III produced over 70 kg/ha/day between 9th June and 19th September.

WEEDS

Further studies with *Datura* spp. (thornapple) at Tamworth have shown that competition commences earlier in maize, sunflower and mung beans than in the previously studied soybean crop. The use of cultivators about 4 weeks after sowing proved very effective in maize, sunflower, soybean and grain sorghum but not in mung beans.

The screening of Total Vegetation Control herbicides was continued in co-operation with departmental chemists. These studies include the effect of activated carbon on herbicide phytotoxicity and the use of activated carbon to improve bioassays performed with the object of detecting herbicide residues in soil.

At Orange, a simulation model of a spreading plant population has been developed which highlights the importance of population growth rate in the spread of plants.

Silverleaf nightshade is difficult to control chemically because of its deep and extensive root system. Means of increasing the effectiveness of the more promising herbicides for the control of

silverleaf nightshade by adding surfactants, or by modifying application methods, are being investigated.

In a new project at Wagga the different tolerances of wheat cultivars to herbicides are being determined.

SEEDS

The unsuitability of the prescribed laboratory germination test as a predictor of the field planting value of soybean seed has been demonstrated. Whereas the routine tests did not indicate the failure of many lines of seed in the field, a rapid ageing test provided an accurate guide.

HORTICULTURE AND HORTICULTURAL PRODUCTS

CITRUS FRUITS

Planting Density and Tree Size Control

A major programme is under way to study the relationship between tree density, dwarfing (transmitted by bud inoculation from dwarfed trees) and fruit yield and quality.

At Yanco dwarfed Valencias on *Poncirus trifoliata* rootstocks, planted at 2 x 1 m spacing in 1973 already have a cumulative yield of 133 t/ha, compared with 32 t/ha for trees spaced at 5 x 3 m. Closely planted uninoculated trees have also yielded well but tree crowding is apparent. Cropping of Bellamy Navel trees on *P. trifoliata* has been enhanced by inoculation with buds from a dwarfed Unshiu mandarin selection. The effect has been consistent over 7 crop years and is due mainly to an increase in fruit number. There has been no effect on tree size.

At Dareton dwarfing inoculations of Bellamy Navel trees have reduced tree size on *P. trifoliata*, with lesser reductions for Troyer and Carrizo citrange and Rangpur lime and none for Sweet Orange, Rough Lemon or Emperor Mandarin. However, direct propagation of dwarf trees on Troyer citrange has increased the 25 per cent dwarfing effect, obtained with bud inoculation. This opens the way for the development of ultra high density plantings with citrange as well as *P. trifoliata* rootstocks.

At Gosford inoculating Eureka and Lisbon lemons has induced dwarfing. The greatest effect on the 6-year-old trees with both scions, is with Smooth Seville and Bowman citrange and inoculant strain 3761.

Thinning of 17-year-old double planted Valencia trees on sweet orange from 374 to 187 tree/ha at Dareton resulted in a marked enhancement of cropping in the first year after thinning through increased fruit set and size, that compensated for the removal of the alternate trees. This response indicates that in mature vigorous double planted orchards, thinning may be beneficial in overcoming inter-tree competition for light.

Citrus Improvement—Rootstocks and Varieties

Rootstock trials with a range of citrus fruit are planted at Gosford (Somersby Section), Yanco and Dareton. These include Valencia orange scions (all three Stations), navel oranges (Gosford and Dareton), grapefruit and Ellendale tangors (Dareton) and mid-season oranges (Gosford and Yanco).

At Dareton 20-year-old Marsh grapefruit, inoculated after planting with a mild strain stem pit virus to give protection against severe strain infection, have yielded less than the uninoculated controls. These trees remain in good health despite the presence of severe strain infected trees in the planting.

Rough lemon continues to be a most productive rootstock in trials with Ellendale mandarin, Lanes' Late navel at Dareton and even in replant situations with lemons at Gosford. Yields at Dareton from Ellendale mandarin trees propagated as cuttings, have been decidedly inferior to those on rootstocks. With both the Barlow and Leng selections 4 year cumulative yields are highest for trees on Rangpur lime rootstock.

Mechanical Harvesting

The experimental air blast citrus harvesting machine was modified at the Agricultural Engineering Centre. These modifications together with a pre-harvest application of Pik-off® (125 ppm), followed two days later by Release® (100 ppm), to reduce fruit removal force resulted in an improved 88 per cent recovery of Valencia oranges in December, 1978.

Salinity and Irrigation

Under-tree micro-sprinklers have proved a suitable alternative method of irrigating mature citrus trees to conventional overhead systems at Dareton. Evaluation of chloride uptake by citrus rootstocks will allow them to be ranked for salt tolerance.

Citrus Nutrition

In a comprehensive experiment on Valencia oranges at Dareton, nutrition level has had little effect on yield over 7 crop years. High nitrogen increased skin thickness and roughness while high potassium and phosphorus increased regreening.

Post Harvest Research

The efficacy of guazatine (Panocrine®), at low concentrations, for controlling benzimidazole resistant green mould and sour rot was confirmed in commercial-scale trials. A low cost operation of dipping fruit in fungicide ethephon mixtures was shown to be feasible for colouring lemons.

STONE AND BERRY FRUITS

Peach Trellising and Training

Peach trellising and training experiments for dessert peaches at Bathurst and canning peaches at Yanco were established in 1976 and 1977. First yield data were collected from the Bathurst experiment in 1979 with the Tatura trellis giving highest production. The Yanco trees will produce their first major crop in 1980.

Rootstocks for Prunes and Apricots

Buck plum has been shown to be a superior rootstock for D'Agen prunes at Yanco and Young and Morocco and Trevatt apricots at Yanco. The response with prunes is related to the larger trees induced by Buck plum at both sites compared with Marianna, Damas C., Brompton, Ackerman, and St Julien A.

Strawberries

Selection and testing of seedlings to produce new varieties continued. Two 1978 selections, 78/6, 78/19 and twenty-nine 1979 selections were retained for further evaluation while 600 seedlings have been planted for 1980 selections.

Miscellaneous Berries

A leaf bud propagation technique has been developed to provide a more rapid build-up of bramble planting material. It has a potential of 200 to 300 plants per mother plant.

POME FRUITS

Mechanical Hedging of Apples

Mechanical hedging is slowly becoming accepted as a feasible alternative or addition to detailed pruning of pome fruits. Techniques for managing mechanical hedging of apples have been successfully demonstrated at Orange and Batlow for two years. The use of NAA in pruning paint formulations has reduced water shoot growth from pruning cuts. Summer hedging alone was adequate to control tree growth.

Rootstocks, Tree Training and Spacing

At Orange the effects of tree spacing within the row on yield are being compared in a 1967 planting of Jonathan, Delicious and Granny Smith apples on MM.102, MM.104, MM.106 and Northern Spy rootstocks. Trees planted at a density of 862 per ha and trained to a central leader produced 130 t/ha between the ages of 4 and 8 years, compared with the average yield of 10 t/ha for vase trees at 250 per ha. Net returns increased by about \$320 for each 0.15 m unit decrease in spacing.

Post Harvest Research

In tests at Gosford aimed at meeting Japanese quarantine requirements fumigation of apples with 32 g/m³ methyl bromide for two hours at 10° C and 17° C, followed by 10 days storage at 1.5° C resulted in 100 per cent mortality of both eggs and larvae of Queensland fruit fly.

A correlation between the amounts of abscisic acid and low temperature storage breakdown in Jonathan apples has been confirmed. Injection of calcium salt into the core of the fruit, reduced breakdown and the level of abscisic acid.

TROPICAL FRUITS

Bananas

A collection of 33 banana varieties has been established at Alstonville for assessment. They fall into the categories of fresh fruit, cooking and ornamental. The most productive in the last two seasons have been Dwarf Cavendish, 2390, Silver Bluggoe and the cooking variety Corne Plantain.

A technique of defoliation at a particular growth stage to spread banana production more evenly through the year is being developed at Alstonville.

Emerging banana bunches sprayed in summer with 0.1 per cent omethoate, to control flower thrips, showed 50 per cent less corky scab damage in the autumn-winter months compared with non-sprayed bunches.

Avocados

In the avocado root rot management trial established in 1973 at Alstonville the cover crop plus gypsum treatment has for the second consecutive year doubled yield in comparison to other treatments. There has been no marked treatment effect on incidence of *Phytophthora cinnamomi*.

Other Tropical Fruits

Assessment and characterisation of varieties of litchis and clonal guava selection has commenced at Alstonville. Guavas at Yanco were either killed or severely damaged by winter frost, virtually eliminating any commercial prospect of this crop in the M.I.A.

Summer pruning of custard apple has shown promise as a means of inducing the growth of mixed vegetative/floral buds which set fruit during the more favourable late summer months of high humidity/rainfall on the north coast.

GRAPES AND WINE

Wine Grape Varieties and Clones

Testing of wine grape varieties new to the area continued. Outstanding among the newly tested varieties was Chambourain which is highly resistant to disease and which produced a most attractive style of red wine.

Selections of the major wine grape varieties are being assessed at Griffith. Of particular interest has been an imported French Malbec clone (INRA 1056) which has given heavy crop yields and good quality fruit. Two heat-treated Chardonnay clones from California have also given superior yields and quality. The Swiss Pinot noir Marifeld continued to be the outstanding selection of this variety in cropping and bunch loosening.

Gordo clones J2 and E4, and the UCD currant clone (heat treated) were found to be the best after 6 years of cropping at Dareton. The Gordo clones produced an average fresh yield of 41 t/ha year and a dry yield of 10 t/ha while the current commercial clone had a dry yield of 5.2 t/ha. Average yield of currants was low for all clones because preharvest rains in the past 3 years has caused berry splitting.

Mother vine plantings of all clones have been established in the district from which cuttings are available for grower use.

Nematode Resistant Rootstocks

The performance of nematode resistant rootstocks has been assessed. Cabernet Sauvignon, Shiraz, Muscat Gordo Blanco and Semillon grafted on Salt Creek have had yield increases over own-rooted vines of 33 per cent, 43 per cent, 28 per cent and 19 per cent respectively.

Mechanical Pruning

The viticultural effects of hedging vines to a set shape have been investigated since 1974. A hand pruned control was compared with treatments hedged to square, triangular and off-set rectangular shapes. After five crops there have been no consistent yield differences between treatments although the more lightly hedged treatment vines developed excessively in the crown area at the expense of the vine ends.

Late Pruning

The concept of late pruning as a means of improving grape and wine quality and delaying harvest was taken up by several winemakers in both the M.I.A. and Hunter Valley in 1978-9. Most successful was the Orlando M.I.A. project, which saw 6 000 litres of wine made from late pruned Shiraz. The wine was superior in colour, flavour and acid balance to a control made from untreated grapes, so much so that the Company launched it at a testing attended by city wine writers with subsequent excellent coverage in the media. Despite the 50 per cent yield reduction, the co-operating grower and winemaker intend to late prune a similar area next season. Experimental work aimed at reducing yield losses will continue.

VEGETABLES

Potatoes

Several selections of potatoes bred at Glen Innes have outyielded Sebago in sandy soils at Yanco. Some of these were also superior in quality. Two Glen Innes lines, S.3041 and S.3072, have shown promise as alternatives to Sebago at Dorrig.

At Berrigan soil applications of dolomite and foliar applications of molybdenum and boron have shown promise in improving potato yields.

Tomatoes

Two hybrid varieties of fresh market tomatoes, Red Supreme and Rich Reward, have been released from the breeding programme of the Horticultural Research Unit, Richmond. They are resistant to the soil-borne diseases *Verticillium* and *Fusarium* wilt, and root knot nematodes.

Assessment of introductions in the search for a suitable whole peel processing variety continued at Leeton, Cowra and Trangie. K 10, despite a tendency to shatter and crack, is the most promising alternative to V.F. Napoli.

Furrow mulching and cultivation improved the furrow irrigation of problem soils in the Narromine-Trangie area, but not enough to allow the use of wide beds for tomato production.

Miscellaneous

Twelve green bean varieties were compared on the south and north coasts. There was strong variety x site interaction in 1979 with New Pioneer performing reasonably well on both sites.

Spring and winter lettuce varieties were tested at Somersby, near Gosford. The best spring lettuce were Climax King Lake, Yatesdale and Acefield, while the best winter lettuce were Winterlake, Rumseylake and Black Velvet.

Post Harvest Research

Improved methods of postharvest handling of rockmelons have been developed to allow the marketing of fully mature rockmelons, including treatments for control of *Fusarium* and *Geotrichum* rots and rapid pre-shipment forced air cooling.

Hot air curing of onions has nearly doubled economic keeping life. The orange-fleshed sweet potato variety Jewel has been shown to have good keeping qualities as well as high yield potential.

ORNAMENTALS

Glasshouse Watering

Experiments at Gosford with a wide range of plant species showed that the temperature of irrigation water often affected seed germination and growth of herbaceous seedlings and established plants. Seeds frequently germinated earlier in response to watering with warm water (25° C) and internode length of seedlings was also influenced by water temperature. Growth of many sub-tropical and tropical greenhouse plants was reduced with cold irrigation water (5° C).

LIVESTOCK AND LIVESTOCK PRODUCTS

ANIMAL HEALTH

Bluetongue—Related Viruses

A series of research projects was undertaken on bluetongue-related viruses. Diagnostic procedures were greatly improved by the further development of the gel diffusion precipitin test (GDPT). By using different antigens two tests of different specificity are now available. The test of broader specificity detects reactions to a wide range of bluetongue-related viruses. In the Australian situation the test of narrower specificity appears to detect only antibody to the Australian bluetongue virus (BT20). The GPDT developed at Glenfield has been adopted nationally with reagents and standards being supplied from the Veterinary Research Station, Glenfield.

On applying the basic GDPT to survey for antibody in cattle of different ages it was demonstrated that the prevalence of antibody increases with the age of the animals. From this it was possible to estimate the incidence of bluetongue-related viruses in past years. It was also demonstrated that the strength of the reaction increases with the age of the animal. From information obtained on both of these aspects it was deduced that the bluetongue group reactions of New South Wales cattle are probably due to multiple exposure to distantly related viruses which do not qualify for classification in the bluetongue group.

Comparison of antigens of, and antibodies to, related viruses has allowed low level cross-reactivity between BT20 and other Australian orbiviruses to be demonstrated. The degree of cross-reactivity is probably inconsequential unless multiple exposure occurs.

An attempt to recover bluetongue-related viruses from cattle was undertaken by regular bleeding of selected cattle in the north and central coast areas. An epidemic of infection by a D'Aguilar sub-group of viruses was detected. However, this virus does not explain completely the serological picture observed in cattle and further work on this problem is required.

Bovine Tuberculosis

An investigation was carried out over seven years to determine the types of mycobacterial organisms involved in cases of bovine tuberculosis in New South Wales. The lesions of suspected bovine tuberculosis were examined by culture, histopathology and auramine-O (AO) stained smears and the findings correlated with field aspects of the disease.

Of 642 lesions considered to be tuberculosis, 62 per cent yielded *Mycobacterium bovis* and 4.5 per cent other mycobacteria (OM). *M. bovis* and OM were recovered also from 0.6 per cent and 3.6 per cent respectively of 165 cattle which gave tuberculin reactions but had no visible lesions at slaughter. Of 262 lesions in which a histopathological diagnosis other than tuberculosis was made, 1.5 per cent and 3.0 per cent yielded *M. bovis* and OM respectively. All OM isolates tested belonged to the *Mycobacterium-avium-intracellulare-scrofulaceum* (MAIS) complex with a predominance of Serotype 2.

A good relationship was found between the recovery of mycobacteria and histopathology but examination of smears revealed 22.0 per cent apparent false negatives. Apparent false negative culture results were also reported for 35.8 per cent of lesions positive on histopathology and smear examination.

The majority of herds yielding *M. bovis* contained reactors to the tuberculin test and many of these had lesions to tuberculosis. In contrast, herds yielding OM seldom contained reactors to the tuberculin test and rarely reactors with tuberculous lesions. The thoracic cavity was the main site of lesions from infections by *M. bovis* and OM.

Mucosal Disease

Support was received from the McGarvie Smith Institute for work on mucosal disease (MD) in cattle with some work on sheep. Salient findings include:

- Improvement in diagnostic procedures was obtained by enhancement of the strength of the gel diffusion precipitin test and improved techniques for the isolation of the virus.
- Hypomyelinogenesis congenita of sheep was investigated by transmission trials and pathology. Examination of material from this work for MD virus led to its identification and acceptance as the prime aetiological agent. Co-operation with workers in the United Kingdom and New Zealand allowed demonstration of agents of the group as the causes of similar diseases (border disease, hairy shaker syndrome) in those countries and the work was subsequently confirmed in America. This is the first time, anywhere in the world, that the aetiology of these conditions has been determined.
- Surveillance of cattle herds in which MD was enzootic revealed that animals with circulating virus, and which are clinically normal, are not uncommon. This helps to explain some of the epidemiology of the disease and affords a means of identifying carriers in herds where it is desired to eliminate the disease.
- The epidemiology of infection was defined in a beef herd. It was shown that survival of the virus depends on the presence of carrier animals and that each calf drop becomes infected after loss of maternal immunity at 4–6 months of age.
- The demonstration of viraemic animals that remain clinically normal for years while dropping a calf each year is considered to be the most important finding relating to epidemiology and pathogenesis of this disease. Calves of such viraemic cows appear to be invariably viraemic but may or may not develop disease. This led to the recognition of families of animals in which the members are viraemic.
- Further evidence of the widespread occurrence of the virus came from a study of foetal calf serum. This serum was being processed by a large commercial organization. The information also led to suitable tests for detection of viral contamination of this valuable product.

Copper Deficiency in Cattle

An extensive investigation is being carried out of the copper status of cattle in different parts of New South Wales. Blood samples which are collected for the brucellosis eradication campaign are used. These are subjected to analyses for the copper bearing enzyme, ceruloplasmin. The results to date show a very wide range of blood copper values with low values occurring in parts of the state. There also appears to be a seasonal influence in the serum concentrations.

As a preliminary to this investigation detailed investigations were made on the analytical and technical procedures involved. A new semi-automated method of ceruloplasmin was established and some critical features in the methods of blood collection were determined.

Use of Iodine Teat Dips in Mastitis Control

Teat dipping after milking is very effective for the control of mastitis. Of the teat dips currently available those containing iodine are the most effective. However their use can alter the iodine content of the milk and this is of public health significance.

To acquire more precise information on various aspects of the problem a detailed experiment was carried out. The cows in the herd were divided into two teat dip treatment groups, 1 000 mg available iodine per litre (AvI/L) and 5 000 mg AvI/L, and levels and rates of new intramammary infection were monitored.

The low concentration sanitizer caused a reduction of only 17 per cent in new intramammary infection which was not significantly better than the undipped control group. The 5 000 mg AvI/L solution resulted in a 49 per cent drop in the level of infection which was significantly ($P < .01$) less

than the level in the control group. At the same time, milk samples were also collected from each treatment group and assayed by the Dairy Industry Authority of New South Wales for iodine concentration. There was no significant difference in the mass of iodine in milk following sanitation with both teat dips, but in both groups the addition was significantly higher than in the undipped control group. Dipping with 1 000 AvI/L resulted in an addition of 70 µg AvI/quarter (qtr) while dipping with 5 000 AvI/L added 99 µg AvI/qtr. Lack of premilking washing caused an addition of 154 µg AvI/qtr when the low concentration sanitizer was used and 291 µg AvI/qtr following use of the 5 000 mg AvI/L sanitizer. This emphasizes the importance of pre-milking washing.

Ovine Brucellosis

This disease is an important cause of ram wastage and of reduced reproductive efficiency in sheep. State-wide research is under way to gain a better understanding of the disease and of testing and eradication procedures.

At the Regional Veterinary Laboratory, Wagga Wagga, the disease is being studied in infected rams at slaughter. Detailed examinations are made of the distribution of gross and microscopic lesions in the genital organs. Concurrently, the distribution of the *Brucella ovis* organism throughout the tract is being studied.

In a project at the Regional Veterinary Laboratory, Armidale, the responses following experimental infection were studied. Observations were undertaken at weekly intervals for 1 year to follow changes in clinical, bacteriological and serological parameters. Clinical lesions were detected in 1 ram 3 weeks after inoculation and in all rams by 8 weeks; lesions were undetectable in 3 rams at the completion of the trial. Detection of inflammatory cells in semen samples was the earliest indication of infection being positive in 2 rams at 2 weeks and in all rams by 8 weeks; subsequently 86 per cent of samples were positive. Detection of *B. ovis* in semen smears was positive in 3 rams at 4 weeks but only once in all rams at 27 weeks; overall 52 per cent of semen smears were positive from 4 weeks onwards. Culture of *B. ovis* from semen was positive in 5 rams after 4 weeks and in all rams by 5 weeks; thereafter 97 per cent of samples were positive. All rams developed significant titres to the complement fixation test (CFT) between 2 and 9 weeks; thereafter the CFT was a reliable indication of infection in 6 rams, highly suggestive of infection in 3 and unreliable in 1. By 8–10 weeks all rams developed significant titres to the indirect haemagglutination test which were then maintained for the remainder of the trial.

At the Veterinary Research Station, Glenfield, observations were made on the mechanism of spread under natural conditions of mating. This yielded few successful transmissions. Subsequently, transmission was achieved using intranasal and rectal routes and by the use of ewes. In these cases clinical lesions and interval till recovery of *B. ovis* were slower than in the Armidale experiment. Work on this problem is continuing. Also at Glenfield, studies were undertaken on the immunological response following infection and on alternative diagnostic procedures.

Serological Surveillance of Poultry Diseases

Effective monitoring of the occurrence of diseases is important particularly in the intensive poultry industry. Earlier work had developed a range of serological tests able to detect a wide range of diseases. These were applied to blood samples collected from representative poultry populations within New South Wales. The survey produced a baseline for future surveillance studies.

The findings for the major diseases are as follows:

- Antibody to *Mycoplasma gallisepticum* was widespread throughout New South Wales but was of lower incidence in nucleus flocks due to the success of voluntary eradication programmes. There was also evidence of the failure of some of the eradication programmes as well as continued infection at the parent breeder level.
- *M. synoviae* antibody was detected infrequently and most nucleus flocks were free from infection.
- The low incidence but wide distribution of antibody to *Salmonella pullorum* antigen was considered to indicate infection with other *Salmonella* serotypes.
- Newcastle disease virus (NDV) antibody was variable in its distribution, being less frequent on farms which maintained a high level of quarantine (e.g., nucleus farms) or operated on an "all-in-all-out" system (e.g., broiler farms). The incidence appeared to fluctuate from year to year and even from month to month in the same flock. This suggested that an erratic and unpredictable spread of NDV was occurring.
- Marek's disease virus antibody was present in all flocks except for a few broiler flocks. Its occurrence and distribution did not appear to be affected by prior vaccination with herpesvirus of turkeys vaccine.
- The wide distribution of antibody to adenovirus suggested that reinfection was occurring on most farms.
- Infectious bursal disease virus antibody was present in almost all flocks tested and appeared capable of surviving rigorous hygiene procedures as it re-occurred on farms from year to year. Its presence on breeder farms was considered desirable to allow transfer of maternal antibody to progeny.
- Surveillance of breeding flocks for avian encephalomyelitis virus antibody indicated that flocks were being successfully vaccinated.

ENTOMOLOGY BRANCH

Biological control

Problems associated with the use of pesticides, particularly the development of resistance, residues in food and the escalating cost of chemicals are providing impetus for research on biological control of pests and weeds. Entomology Branch was engaged in research projects using biological control as part of pest management programmes in a number of crops, including deciduous fruit and strawberries. Phytophagous mites are important pests of these crops due to the elimination of their natural enemies by application of broad spectrum pesticides to control primary pests. The release of the imported OP-resistant predatory mite, *Typhlodromus occidentalis*, in apple orchards to control two-spotted mite has continued. This programme is fulfilling the promising results reported in the 1977-8 Annual Report. *T. occidentalis* is now established in 59 apple orchards. Considerable reduction in miticide usage was possible in many of these orchards and grower demand exceeded supply of the predator which is being mass cultured at Bathurst Agricultural Research Station.

T. occidentalis is not effective against phytophagous mites in strawberries but a predatory mite new to Australia was discovered in commercial strawberries near Sydney. The mite, *Phytoseiulus persimilis*, is known to be highly effective in certain situations overseas and it now appears possible that use of this predator in combination with the native *Amblyseius womerslyi* could significantly reduce the application of miticides in strawberries.

A detailed taxonomic study of Australian predatory mites of the family Phytoseiidae, which includes the species mentioned above, was continued and during the year several new species were described. This investigation has demonstrated that the apparent paucity of native phytoseiids was due to inaccurate identifications by earlier workers. In connection with this work Dr E. Schicha, Special Entomologist, was awarded a Scientific Fellowship by the French Government to collect and identify phytoseiid mites from New Caledonia. Again, several new species were found and have been described.

An entomologist and a technical officer were appointed in July 1978 to investigate the biological control of prickly pear cacti, particularly tiger pear. The Prickly Pear Destruction Commission has had increasing difficulty in preventing the spread of tiger pear within its budget due to the high cost of chemical control. A State-wide survey showed that tiger pear has spread along many of the river systems in north-eastern New South Wales and is now present on properties covering one million hectares. The degree of infestation and the number of newly infested properties is in general increasing. Prickly pear cochineal (*Dactylopius austrinus*) appears to be the most important biological control agent. Laboratory studies showed that it developed between 16.5° C and 30° C indicating that it may not be effective in cooler regions of the State.

Lucerne aphids

Spotted alfalfa aphid (*Therioaphis trifolii*) and blue green aphid (*Acyrtosiphon kondoi*) caused severe and widespread damage to Hunter River lucerne in 1977-8. Some growers persevered with this variety in preference to imported resistant varieties, using insecticides to control the aphids, particularly in irrigated stands. In March, 1979, two such growers in the Tamworth area reported complete control failure with demeton-S-methyl against spotted alfalfa aphid, following regular use of this chemical at high rates for two years. The remainder of the recommended insecticides (dimethoate, pirimicarb and thiometon) were also ineffective against the Tamworth aphids. Laboratory tests, using a new technique, confirmed that the aphids were resistant to these insecticides and several others. However, the tests also showed that the aphids were susceptible to some readily available insecticides. Subsequent field trials demonstrated that several of these insecticides, including chlorpyrifos, were highly effective. Resistant spotted alfalfa aphids have, so far, only been detected in the Tamworth area and chlorpyrifos is now recommended for their control. There was no evidence of resistance in blue green aphid.

Wingless grasshopper

Wingless grasshopper (*Phaulacridium vittatum*) has become a regular and serious problem in the Tablelands in recent years. A research programme was started in spring 1978 to improve the current control technique of spraying established infestations of large nymphs or adults with insecticides. Spraying of young hoppers from synchronized hatching on upper slopes and ridges was sufficient to prevent extensive damage. Later protracted hatching on valley slopes and flats produced large numbers of hoppers, but high natural mortality of early instars prevented significant damage. Biological control techniques are also being evaluated in the research programme. During preliminary studies an unidentified nematode parasite caused significant mortality of wingless grasshopper in the northern and central tablelands. The pathogen *Nosema locustae* was released in the New England Region in collaboration with the Victorian Department of Agriculture. The release failed to induce an epidemic of the disease, although a low incidence of infection was established. Limited feeding on the contaminated bait under the lush pasture conditions prevailing at the time of release was possibly responsible for the low infection rates recorded. Further trials using a foliar application of spores and a variety of baits will be tested in the 1979-80 season.

Replacements for organochlorine insecticides

Work continued to find effective replacements for persistent organochlorine insecticides to control pests of establishing crops and pastures. In July-August two fields trial were carried out

against black soil scarab larvae (*Othnonius batesii*) in wheat at Trangie. The most effective treatments were terbufos (0.5 kg/ha) and phorate (0.5 and 2.0 kg/ha) applied as granules drilled in with fertilizer at sowing. Grain harvested from the terbufos and phorate 0.5 kg/ha plots contained no detectable residues.

African black beetle (*Heteronychus arator*) is an important pest of maize, vegetables, prepared turf and pastures. Dry weather during the past three spring-summer periods favoured it and adults were present in plague proportions on the coast during 1977-8 and 1978-9. In September-December several promising alternatives were compared in maize at Lower Coldstream and Bodalla. The most effective surface incorporated granular treatments were isazophos (1.0 kg/ha), bendiocarb and chlorpyrifos (1.5 kg/ha) and phorate and terbufos (2.0 kg/ha). Isazophos (1.0 kg/ha) and chlorpyrifos (3.0 kg/ha) as surface band sprays were also effective. In November-December a field trial was established at Dorrigio against African black beetle in potatoes. The chemicals were applied as surface incorporated granular band treatments at hilling. Isazophos and terbufos (2.0 kg/ha) and bendiocarb, chlorpyrifos and phorate (3.0 kg/ha) gave effective control. No residue problems were encountered.

Control of grain insects

Two insecticide trials to prevent development of infestation in farm stored grain were completed. Barley and wheat sprayed with 3 ppm pyrethrins plus piperonyl butoxide in December, 1976, were stored in good condition for 22 months in iron farm silos, with only peripheral infestation by lesser grain borer (*Rhyzopertha dominica*), rust-red flour beetle (*Tribolium castaneum*) and long-headed flour beetle (*Latheticus oryzae*). Untreated grain became heavily infested and was twice fumigated in that period. In the second trial, wheat sprayed with 2 ppm pyrethrins plus piperonyl butoxide in November, 1977, remained uninfested for 10 months. A new trial was commenced at Condobolin in December, 1978, to compare low rates of pyrethrins with mixtures of fenitrothion 12 ppm and bioresmethrin 1 ppm or carbaryl 10 ppm as grain protectants. By April, 1979, rust-red flour beetle was numerous on the grain surface and at outlets of silos of wheat treated with 1.5 ppm or 2 ppm pyrethrins but the other treatments remained completely effective after five months storage.

Fumigation with phosphine is often used for disinfecting grain after prolonged storage, when insecticide protectant treatment has ceased to be effective. Further investigation of resistance to phosphine, detected last year in two strains of lesser grain borer, indicated x7-10 fold resistance after selection of the strains by exposure to phosphine in the laboratory. Phosphine resistance is also suspected in seven strains of rust-red flour beetle and one strain of confused flour beetle (*Tribolium confusum*) from New South Wales.

CHEMISTRY BRANCH

ANALYTICAL CHEMISTRY

Inductively Coupled Plasma Spectroscopy

An evaluation of Inductively Coupled Plasma (ICP) Atomic Emission Spectroscopy was undertaken. ICP, a simultaneous multielement technique (more than forty elements can be determined simultaneously), was found to be suitable for the routine inorganic analysis of plants, soils, fertilizers and waters. Its accuracy was similar to that of current methods. Its major advantage lies in its speed of analysis and the range of elements analysed. Unfortunately, it conveys no advantages in terms of simplicity or speed of sample preparation, which is the rate limiting step in sample throughput.

Bromide Residues

Mushroom compost is commonly sterilized by fumigation with methyl bromide. Three methods of determining traces of inorganic bromide in compost and mushrooms are being investigated in conjunction with the Queensland Department of Primary Industries. One method is based on conversion of bromide to bromoethanol, which is measured by gas chromatography (GC). A second method measures bromide potentiometrically, after removal of interfering substances by ion-exchange chromatography. The third method involves the direct determination of bromide by X-ray fluorescence (XRF) spectroscopy. The rapid XRF procedure was comparable to the much slower GC procedure at bromide concentrations above 30 ppm and was superior to the GC procedure at lower concentrations.

PLANT AND CEREAL CHEMISTRY

Rain-Damaged Wheat Tester

A rugged, portable, semi-automatic instrument was developed for use by grain handling authorities which will enable them to determine whether or not wheat being delivered to silos has been damaged by rain. Rain-damaged wheat is normally used only for stock feed purposes. The new tester utilizes the highly sensitive alpha amylase enzyme assay previously developed by the Chemistry Branch for determining rain damage in the laboratory. This assay has been widely adopted in the United States of America and Canada. The tester is currently being evaluated by grain handling and marketing authorities throughout Australia.

Polysaccharides in Legume Seeds

The biosynthesis of reserve polysaccharides in developing legume seeds was studied. A new enzyme was discovered and named "phosphomannomutase". Novel fractionation and purification procedures were developed so that phosphomannomutase could be separated from other enzymes in seed extracts. The properties of other enzymes involved in polysaccharide biosynthesis were studied. The discovery of the new enzyme coupled with the properties of known enzymes provided strong evidence that the pathway of biosynthesis involves the conversion of glucose and fructose phosphates to nucleotide mannose compounds which in turn are converted to polysaccharide, via the 1- and 6-phosphates of mannose.

Chickpea and Lupin Carbohydrates

The chemistry of chickpea and lupin seeds is being studied in conjunction with a breeding programme. Chickpeas were found to contain sixty per cent carbohydrates of which eighteen per cent was starch. Soluble sugars (twelve per cent) consisted mainly of glucose, fructose and higher oligomers such as sucrose, raffinose, stachyose and verbascose. In new lupin cultivars, higher oligomers constituted sixty to seventy-five per cent of the seed compared with eighty-eight per cent in the older cultivar Weiko-111. The predominant sugar in all cultivars was stachyose, and oligosaccharide levels exceeded monosaccharide levels. These seed characteristics are important as a factor of preference in human and animal nutrition.

Amino Acid Availability in Stock Feeds

Pigs utilize the lysine in certain feedstuffs only poorly. Chemical tests have failed to predict lysine availability in pig feeds, so a bioassay based on the growth of chickens was developed. A marked difference was found in the ability of chickens and pigs to utilize lysine in some feedstuffs. Tests are now in progress to determine whether or not similar differences occur in the utilization of other amino acids and whether or not chemical tests can be used to predict lysine availability in chicken feeds.

Plant Thiaminase and Polioencephalomalacia

Development of thiamine deficiency and polioencephalomalacia in sheep grazing nardoo fern was linked to the levels of Thiaminase 1 Enzyme and its co-substrate amine bases in the fern. Feeding studies using small animals (mice, chickens and guinea pigs) have demonstrated the importance of amine levels in the ration on development of the disorder. Amines were essential for thiaminase enzyme activity. They were not toxic in themselves nor did they form complexes which inhibited other enzymes. Feeding studies using sheep are in progress to establish threshold levels of enzyme and co-substrate necessary to induce the condition.

PESTICIDE CHEMISTRY

Guazatine Residues

A rapid and sensitive method for measuring micro quantities of the new fungicide, guazatine, was developed. The method is based on the characteristic absorption at 585 nm of a starch stabilized complex of guazatine and a dye, coomassie brilliant blue G250. The procedure is suitable for the measurement of guazatine residues on citrus fruit following postharvest treatment and for monitoring guazatine concentration in the fruit dip. Development of the method has enabled the introduction of guazatine to replace benzimidazole fungicides to which some mould species have developed resistance.

Pesticide Residues in Cured Tobacco

Following the discovery of very high DDT residues in some of the 1977 tobacco crop from northern New South Wales, a survey of pesticide residues in commercially dried leaf from the 1978 crop was conducted on four farms. Only organochlorinated pesticide residues were detected. DDT and endrin levels approached or exceeded the maximum residue levels permitted by West German authorities (there are no Australian standards), but endosulfan levels were well within those limits. DDT and endrin are not required for tobacco production as alternative pesticides are available. A wider survey planned for 1979 should indicate the extent of their misuse in New South Wales.

SOIL FERTILITY AND PLANT NUTRITION

Apple Nutrient Status

Three years of a five-year survey of the nutrient status of apple orchards at Armidale, Orange and Batlow have been completed. Leaf nutrient concentrations are being related to deficiency symptoms, fruit production, fertilizer use and other management factors, as a basis for reviewing leaf nutrient concentration standards. Cyclical fluctuations have been found between seasons on a district basis, macronutrients alternating from being high to low to high, in successive seasons. Low zinc levels have occurred widely in all districts every year and are a cause of concern.

Zinc Deficiency in Maize

Maize will not grow on the black soils of the Liverpool Plains without fertilizer zinc. Fertilizer rates, application methods and residual effects have been measured for the past six years. Zinc broadcast over the soil then incorporated into the surface was more effective than zinc drilled into the soil with the seed. The greatest response was to the initial 5.6 kg Zn/ha with further small increases up to 28 kg Zn/ha. Residual effects of all rates were still very pronounced in the latter years of the trial, but by the fifth year there were responses to current applications as well.

Boron Deficiency in Lucerne

Analyses of many soils from the central tablelands supported by glasshouse trials indicated that soils derived from sandstone, granite, shale or slate were deficient in boron. Lucerne response to fertilizer boron was measured in the glasshouse on four granitic soils. Lucerne growth was increased by boron additions equivalent to 1.3 to 5.2 kg borax/ha. Lime additions enhanced this response.

Acid Soils

In a study of several acid soils an interesting mathematical relationship between soil acidity and aluminium content was found. All soils studied had the same pAl_m value at pH 3.86. At higher pHs, soils had different regression equations, but all showed a direct correlation between pH and pAl_m . The chemical reasons for this behaviour are unknown and are the subject of continuing experiments using four soils which differ widely in their pAl/pH properties.

SOIL MORPHOLOGY AND LAND USE ASSESSMENT

Irrigated Wheat Soils

In the Macquarie River Valley irrigated wheat yields are much lower than in many other irrigated wheat regions of the world. Soil physical factors are thought to be associated with yield decline. A survey of thirteen sites under irrigated wheat in 1978 showed that many of the grey clays have a layer of low permeability at about 30 cm. This layer could be causing water-logging and yield decline. Further work is planned to confirm this and to determine ways of improving subsoil permeability.

Irrigated Tomato Soils

The red-brown loam soils of the Trangie Region are favoured for furrow-irrigated tomato cropping but water movement across the beds ("subbing") is poor. A practical means of improving subbing in these soils is sought. The results of three field trials conducted at Trangie Agricultural Research Station show that both cultivation of the furrows before each irrigation and application of a straw mulch to the furrows and edges of the beds significantly improved subbing. The straw mulch also increased water retention in the beds and appears to be the best treatment.

BIOLOGY

HIGHLIGHTS OF RESEARCH

Weather conditions in New South Wales during 1978 were ideal for outbreaks of *Septoria* leaf blotch disease of wheat and these allowed for the collection of valuable information on the ecology and epidemiology of *Septoria* spp. present in New South Wales. *Septoria tritici*, the most frequently encountered species, was common in southern and central areas but was sparse in the north. *Septoria nodorum* was distributed uniformly except in the far south where it was not found. *Septoria avenae* f. sp. *triticea* was least common and, although widely distributed, appears to cause only a minor leaf spot, usually in association with one or both of the other species.

The effort to develop wheat varieties resistant to *Septoria* has been greatly enhanced by the development of a glasshouse technique for screening breeders' material and by the addition to the *Septoria* Task Force at Wagga, of a pathologist with expertise in host-parasite relationships.

The New South Wales Department of Agriculture's strong commitment to the *septoria* problem in Australia and New Zealand was exemplified during the 1978/9 year when the Department initiated and hosted the Australian *Septoria* Workshop. Over thirty delegates from Australia and New Zealand participated in the workshop, the purpose of which was to provide a forum in which Australasian *septoriologists* could present research results, standardize methods, define objectives and, in general, establish co-operative and coordinated approaches to the problem. There is no doubt that these objectives were achieved.

Work on treatment of seeds to remove pathogens gained momentum during the year following success with studies on *Sclerotinia sclerotiorum* in sunflowers. This fungus is an important pathogen of many crops but is particularly troublesome to sunflower seed producers because it aerially infects sunflower heads and produces in them sclerotia (resting bodies) which are of similar size and weight to the sunflower seeds. As this makes mechanical separation difficult, a chemical seed treatment was sought which would reduce the ability of sclerotia to form the fungus' spore producing

structures, the apothecia. A range of fungicides was tested and benomyl proved completely effective—it inhibited formation of apothecia for the six months duration of the experiment. Thiram, the recommended seed treatment for sunflowers, had no adverse effect on apothecial production and, because it appeared to protect buried sclerotia from microbial decay, may actually favour diseases caused by *S. sclerotiorum*.

The importation of foreign lucerne varieties to combat the aphid problem has presented new challenges to lucerne pathology. While these varieties offer resistance to the spotted alfalfa and blue green aphids, they have little tolerance to our local pathogens. In response to the challenge, the Biology Branch has developed a technique for screening breeders' material for reaction to *Phytophthora megasperma*, the major pathogen of lucerne in this State. Experiments are continuing to expand the technique so that in one planting, breeders can serially screen for not only *Phytophthora*, but also *Colletotrichum* crown rot and bacterial wilt.

Bacterial blotch is the most serious disease affecting the Australian mushroom industry. The toxin which produces the blotch symptoms on mushroom caps has been purified and identified as a formate ester. Once the ester group has been characterized, it will be possible to enzymatically split the toxin. Experimental control of the disease in mushroom beds can then be attempted simply by spraying developing caps with an enzyme preparation.

Although many of the diseases studied in Biology Branch are caused by fungi and bacteria, a smaller but no less important group under investigation are caused by nematodes. These organisms can seriously injure plants simply by feeding, many make wounds through which other pathogens and facultative saprophytes can enter and some transmit viruses. This often ignored group of primitive animals has been intensively studied and, in recent years, progress has been made in the task of cataloguing the soil and plant nematodes of New South Wales. The work has been prepared for publication as a Department of Agriculture Service Bulletin.

AGRICULTURAL ENGINEERING

A single tine dynamometer was prepared for use by engineers at Condobolin and a mobile drawbar dynamometer to measure forces between tractors and tillage implements has been designed.

A machine for combing cashmere from goats by a continuous process has been developed and world patents are being sought.

Modifications to a citrus air harvester have resulted in improved performance from this unit.

A second field trial to assess the efficiency of various tungsten carbide tip configurations for reducing scarifier share wear was completed. In most circumstances none of the treatments would be economically worthwhile.

The main item of equipment developed during the year for the Department's research staff is an Agronomist's mobile rig. This consists of a four-wheel drive truck to act as a road transporter and "tractor", fitted with crop spraying equipment and a soil sampler. A versatile trailed plot seeding machine fitted with a rod weeding attachment was designed and constructed for towing behind the truck. A trailer and plot header completes the whole rig.

Agricultural engineering research was initiated at the Agricultural Research Station, Condobolin with the transfer of two positions of Agricultural Engineer to that Station. The emphasis is towards cultivation techniques in sowing cereal crops.

EXTENSION RESEARCH

Farmers' Use and Knowledge of Pesticides

The first stage of a study of the change in farmers' use and knowledge of pesticides showed that, although most farmers apply the correct pesticides at the correct rate, many had poor knowledge of appropriate safety practices. A second survey will be conducted after the Pesticide Regulations have been promulgated.

Evaluation of Feral Pig Campaign

A cost/benefit study of a three-year campaign to control feral pigs was undertaken with officers in the Western Region. The first stage of the study measured the extent and cost of damage caused by feral pigs and the methods used to control them.

National Workshop on Extension Research

The first extension research workshop entitled "Improving Extension Services through Extension Research", was conducted at the University of Sydney. Ways to increase the relevancy of extension research and the involvement of extension personnel in research were discussed at the workshop.

Consultancy on Monitoring and Evaluation, National Agricultural Extension Project: Thailand

One member of the Extension Research and Evaluation Unit has been involved as a consultant on the above project since July, 1977. He has advised on survey method, questionnaire design, coding, analysis, and training of interview teams.

MARKETING AND ECONOMICS

AGRICULTURAL ECONOMICS RESEARCH

The Division continued to investigate the efficient use of resources by farmers in the production, harvesting and storage of commodities. Specific projects included—Profitability of plain versus developed Merino sheep; the potential of the carpet wool industry; the advantages of syndicated farming; the benefits of better weather information; the benefits of minimum tillage systems; numerous gross margins analyses of crops and livestock production systems; economics of sub-clover seed harvesting; assessment of fencing costs; economics of continuous cropping; assessment of pasture management strategies; implications of changes in taxation laws for primary producers; optimal header size, and economic feasibility of farm level forestry.

The Division continued its research into computer based farm management aids.

The “Complan Model” was further developed and a new handbook prepared with up-to-date gross margins on most crop and livestock enterprises in the New England Region. These gross margins are proving extremely beneficial to producers in this region.

In the southern region, further farm models were prepared under the “Grow Farm” title. These are representative farms, modelled so that the effect of changes to various factors in a farm system can be assessed. The aim is for these models to assist in provision of extension advice and regional planning.

To ascertain financial situation of producers within the State, results of two surveys were analysed.

Research continued on data from rural income and expenses survey in the Central Macquarie Region. Specific areas of investigation included the extent of fluctuations of income, the effects of these fluctuations on consumption behaviour and possible risk reduction strategies.

Survey and analysis was also undertaken to assess the financial position of producers in the southern region of the State.

Economists throughout the State were also instrumental in collecting data for an energy sub-committee. Information was collected on fuel usage for particular enterprises and identification made of the time in the year when most fuel was used.

Increasingly, economists of the Division are undertaking research of the benefits and costs of a wide range of rural practices and policies. Many of these studies are undertaken in co-operation with production divisions. Studies undertaken include—Adopting various blowfly control strategies; lucerne aphid control; poultry research; feral pig control; pasture weeds; pig production research; and irrigated wheat.

Considerable time was spent in the preparation of a report into the storage and handling services provided by the Grain Elevators Board of New South Wales. The Division was requested to prepare this report by a Cabinet sub-committee on management audits. The study involved an assessment of levels of utilization, country storage costs, a planning model for grain transshipment and guidelines for the expansion and contraction of storage capacity.

A range of investigations examining the marketing of agricultural commodities were undertaken. These included—Future of the New South Wales dairy industry; need for management audits of marketing boards; usefulness of marketing orders; monitoring of world trends of prices of agricultural products; examination of potential of new crops in New South Wales and Australia; economic analysis of plant variety rights legislation, and assessment of the accuracy of beef forecasting procedures.

Research continued into uses of and need for continuous availability of agricultural statistics. Reports were prepared emphasising the necessity for agricultural statistics for both farm policy and farm management.

BIOMETRICAL BRANCH

The Branch's major statistical package has been revised and extended to include iterative weighted least squares. This addition enables binomial, poison, gamma and negative binomial data to be analysed by the latest maximum likelihood techniques with consequent gain in efficiency. Models for the analysis of sequential data from grazing trials were clarified and appropriate analyses developed. A set of plant breeding recording computer programmes were introduced for the use of plant breeders in the Department. The theory of relationship algebras was developed for deriving statistical analyses for data with a complex correlation structure. One application was the analysis of data from an incomplete mixture diallel experiment.

ROYAL BOTANIC GARDENS

TAXONOMIC RESEARCH

The identification and classification of living things is an essential base for research and communication in both theoretical and applied biological sciences. The aim of the research of the National Herbarium is to study and understand the identity and relationships of native and introduced plants within New South Wales and to place the knowledge gained into the appropriate Australian and world-wide perspective. To achieve these aims it is necessary to conduct complementary studies at various levels in the taxonomic hierarchy.

Revisions

Revisionary studies are primarily concerned with plant species, their identity, description, and relationships with other closely related species.

New species or subspecies have recently been described in the genera *Crotalaria* (Fabaceae), *Liparis* (Orchidaceae), *Stylidium* (Stylidiaceae) and *Acacia* (Mimosaceae). Studies have been completed on the taxonomy of *Acrotriche* (Epacridaceae), *Neobyrsesia* (Rutaceae), *Zostera* (Zosteraceae); on species of *Acacia* (Mimosaceae), *Eucalyptus* (Myrtaceae); and on genera in the family Cyperaceae.

Considerable progress has been made in projects on classification and relationships of the genera *Grevillea* (Proteaceae), *Leucopogon* (Epacridaceae), *Cyperus* (Cyperaceae), *Livistona* (Arecaceae), *Zieria* (Rutaceae), *Juncus* (Juncaceae), *Chorizandra* (Cyperaceae), *Casuarina* (Casuarinaceae), *Prasophyllum* (Orchidaceae), and *Glycine* (Fabaceae). Revisionary studies of the genus *Stipa* (Poaceae) have been suspended owing to the recent death of Dr Joyce Vickery, but it is hoped that this important work can be brought to completion by her colleagues.

An assessment of the taxonomic value of seed surface structure in the genus *Zieria* (Rutaceae), is nearing completion.

Systematic studies above the species level

Studies on the relationships between genera and between families are an integral part of the research of the National Herbarium. During the past year research has followed a number of lines:

A brief review of the evolution, phytogeography, and adaptive features of the three families Myrtaceae, Proteaceae, and Restionaceae has been submitted for publication. Also, an account of the super-generic classification and evolution of the Myrtaceae has been published.

A phytochemical survey of essential oils and cyanogenic glycosides in the genus *Zieria* (Rutaceae) is nearing completion. Comparative phytochemistry is being studied in the endemic Australian genera of the Solanaceae, in species of the very large genus *Acacia* (Mimosaceae), and in the fern genus *Lastreopsis* (Aspidaceae).

Cytological investigations of the endemic Australian genera of the Rutaceae and Solanaceae are progressing. The results of a recent cytological survey of the Australian fern flora are being processed.

A study aimed at assessing the taxonomic value of pollen morphology in the Australian Epacridaceae is in progress, and an investigation of the generic limits and relationships in the tribe Cyperaceae (Cyperaceae) is under way.

Miscellaneous

A review of biotic pollination mechanisms in the Australian flora has been completed and is in press.

The manuscript for a Census of Angiosperms, Conifers and Cycads of New South Wales is nearing completion and should be finished within the next financial year.

Species descriptions and keys to taxa are being prepared for inclusion in the "Central Australian Flora". Manuscripts dealing with the following families are in preparation: Solanaceae, Lamiaceae, Ehretiaceae, Apocynaceae, Asclepiadaceae, Cyperaceae, Onagraceae, Juncaceae, Plumbaginaceae, Primulaceae and Gentianaceae.

ECOLOGICAL RESEARCH

The ecologists at the National Herbarium are primarily involved in mapping and describing the natural vegetation of the State. The aim of this work is the production of a State-wide inventory of plant communities to which other research, on both plants and animals, can be related.

Survey and Mapping

Mapping of the western half of New South Wales continues. It is intended to publish maps at the 1:250 000 scale in black and white, each with an accompanying memoir. The "Ana Branch" and "Mildura" sheets are in preparation.

Mapping of the Cumberland Plain has been completed and is now being prepared for publication. Detailed vegetation surveys of a number of relatively small sites around Sydney are also in preparation.

Manuscripts resulting from the survey of Lord Howe Island flora and vegetation are in a late stage of preparation. Work on the distribution of plant communities in the Budawang Ranges has been completed.

Regeneration studies

Monitoring of fire regeneration sites continued at Mosman and a manuscript is in preparation. These studies have clearly indicated the inadequacy of management policies in small bushland areas.

Algal ecology

Studies are nearing completion on the algal floras of certain headlands, which may be affected by installations of sewerage outlets. Other studies are proceeding on the algal of inland dams, with emphasis on monitoring occurrences of toxic algal blooms.

EXTENSION

EXTENSION ADMINISTRATION

The clients of this Department include farmers, research workers, commercial firms, financial institutions, schools, colleges, universities, rural youth groups, adult rural groups, other government departments and consumers. To service this wide range of clients, all divisions have located most of their officers in the country.

The Division of Extension Services provides the framework under which District Officers carry out their roles in extension, through decentralized regional administrative units, and district offices. Support staff provided by the Division of Extension Services at regional headquarters and some district offices includes regional extension officers, extension officers, regional publicity officers, regional clerks and field assistants. Office staff and accommodation are administered by the Division, which also provides specialized staff and services at Head Office.

Other Divisions have specialist officers at regional headquarters and Head Office to support district officers. Veterinary staff also have an extension role but are outside the regional extension service.

Support for Extension

During the year many primary producers contributed land, facilities, machinery, livestock and labour towards demonstrations and other extension activities of this department. Manufacturers contributed fertilizers, chemicals, machinery and fencing material for similar purposes. Radio, television and print media gave generously of time and space to foster various extension activities.

Commonwealth Extension Services Grant 1978-9

The Chief, Division of Extension Services, is responsible for the administration of funds for extension and regional research made available by the Commonwealth Government through the Department of Primary Industry.

The total allocation in New South Wales from the Commonwealth Extension Services Grant for 1978-9 was \$2,443,776. The following table records the allocations for salaries, operating and capital, as well as total allocations for the past three years.

Allocation of funds for extension and regional research

Year						Salaries	Operating	Capital	Total
						\$	\$	\$	\$
1978-9	..	..	..	..	..	1,446,984	95,900	95,990	2,443,776
1977-8	..	..	..	..	..	1,625,183	655,202	163,381	2,443,766
1976-7	..	..	..	..	..	1,850,774	423,579	151,850	2,426,203

In recent years, allocations to New South Wales from the Commonwealth Extension Services Grant (C.E.S.G.) have been reduced significantly in real terms, because the money increases have been well below the inflation rate.

Items financed by C.E.S.G. funds were grouped as projects that reflected the organisation of the Department. The following table compares allocations to those projects for the years 1976-7, 1977-8 and 1978-9.

Allocations to projects

Project number	Project title	1976-7	1977-8	1978-9
		\$	\$	\$
501	Agronomy	368,808	436,194	388,375
502	Horticulture	144,151	102,252	120,387
503	Animal Industry	185,677	123,357	139,456
504	Dairying	138,250	49,750	49,613
505	Biometric Services	20,000	25,000	30,000
506	Extension Services	727,885	727,613	850,484
507	Engineering and Machinery Services	147,904	201,500	187,760
508	Agricultural Trainees	4,000	..	..
509	Publications	96,412	110,950	100,086
510	Library Services	34,500	50,000	86,000
511	Training Study Tour Overseas	12,000	30,000	35,000
514	In-Service Training	34,800	78,700	52,500
515	Post-graduate Training	2,000	39,000	34,000
517	Economic and Market Services	315,601	342,720	310,517
518	Biological and Chemical Research	144,215	126,730	59,598
520	Buildings and other major developments	50,000	..	..
	Total	2,426,203	2,443,766	2,443,776

At the request of the Commonwealth Government the format for recording the C.E.S.G. programme was altered for 1978-9 as follows:

Allocations for 1978-9

Project number	Project title	1978-9
		\$
530	Regional/Developmental Research	932,828
531	Market and Marketing Information	88,826
532	Information Services	527,554
533	Farm Financial Management	99,016
534	Farm Organization and Operations Management	613,674
535	Staff Training and Development	121,500
536	Evaluation of Extension and Applied Research	51,000
537	Other Organizations	9,378
	Total	2,443,776

Extension staff in each region

Extension staff	North Coast	New England	Western	Central West	Southern	South West	South East and Illawarra	Mid Coast and Hunter	Total
Regional Director of Extension	1	1	1	1	1	1	1	1	8
Regional Extension Officer	1	1	1	1	1	..	1	1	7
Field Assistant	5	3	3	5	3	6	5	4	34
Extension Officer	3	3	2	3	1	2	3	3	20
Research/Extension Liaison Officer	..	1	..	..	..	..	..	..	1
Regional Publicity Officer	1	1	1	1	1	1	1	1	8
Migrant Liaison Officer	..	..	..	..	..	..	..	..	1
Clerical Officer	2	3	..	2	3	3	2	11	19
Stenographer and Typist (Inc. Casual)	18	11	9	10	8	13	12	11	92
Special/Assistant Principal Agronomist	..	2	1	1	1	1	..	..	6
Research/District Agronomist	..	..	..	..	..	..	..	1	1
District Agronomist	5	8	6	6	4	9	7	4	49
Agronomist	..	..	..	..	..	1	..	..	1
Fields Officer (Weeds)	..	1	1	1	..	1	..	..	4
Seed Production Officer	..	1	1	1	3	..	..	..	6
Tobacco Officer	..	2	..	..	..	..	..	..	2
Special Livestock Officer (Sheep and Wool)	..	1	..	1	..	..	1	..	3
Livestock Officer (Sheep and Wool)	..	5	6	4	4	4	3	..	26
Livestock Officer (Beef Cattle)	3	3	2	2	3	1	3	2	19
Livestock Officer (Pigs)	1	2	1	2	1	1	1	2	11
Livestock Officer (Poultry)	..	1	..	..	..	..	..	3	4
Livestock Officer (Apiculture)	..	1	1	..	..	..	1	..	3
Livestock Officer (Sheep Fertility Service)	..	..	..	..	1	..	..	..	1
Principal Horticulturist	1	..	..	..	..	..	..	..	1
Special Horticulturist	..	..	..	..	..	..	..	..	1
District Horticulturist	6	1	1	2	1	6	2	6	25
Supervising Inspector (Plant Diseases)	1	..	..	1	..	1	..	..	3
Inspector (Plant Diseases)	7	4	2	3	3	12	2	7	40
District Dairy Officer	5	..	..	..	..	1	2	3	11
Dairy Officer	3	..	..	..	..	..	1	1	5
Livestock Officer (Dairy Cattle)	3	..	1	..	..	1	1	3	9
Herd Organizer	..	..	..	..	..	..	1	1	2
Herd Recorder	7	..	..	..	1	5	11	14	38
Agricultural Mechanization Officer	1	2	1	1	1	1	1	..	8
Economist	1	2	2	2	2	2	1	2	14
Locust Patrol Officers	..	..	1	..	..	..	..	..	1
Market Officer	1	1	2	..	1	..	..	..	5
Technical Advisor (Vertebrate Pests)	..	..	1	..	..	..	..	..	1
Pesticides Inspector	1	..	1	1	1	..	1	..	4
Pastures Protection Officer	..	..	..	..	..	..	1	..	3
Totals	77	61	51	51	45	75	65	72	497

EXTENSION PROGRAMMES

NATIONAL AND STATE PROGRAMMES

Mastitis Control

The Mastitis Advisory Service does a monthly bulk milk cell count (B.M.C.C.) of all dairy herds in New South Wales, in conjunction with the New South Wales Dairy Industry Authority.

Since 1973, the State average B.M.C.C. has been reduced from 822 000 to 482 000 cells/mL in 1978-9. The gross value of production resulting from the reduced mastitis level is estimated at \$1.6 million annually. The State target figure of 300 000 cells/mL, means that there is room for further improvement.

Dairy factories were increasingly involved in the programme and one factory made bonus payments for milk with low B.M.C.C.

A farm competition held in the Bega district, in conjunction with Beecham Veterinary Products, for the best and for the most improved B.M.C.C. resulted in increased awareness of the benefits of mastitis control. A similar State-wide competition was organized.

During the year, increased use was made of the cell counter at the Veterinary Research Station, Glenfield, to carry out individual cow cell counting.

National Brucellosis Eradication Campaign

There was increasing extension activity in support of the New South Wales component of the National Brucellosis Eradication Campaign. Personal on-farm visits, supported by circular letters from field staff, were the prime components of extension. During the year, 20 629 herds were tested, involving over 43 000 property visits. All of these visits by field team members were supported by prior contact and follow-up action by other staff members such as supervisors, rangers, veterinary inspectors and veterinary officers.

Static display boards, depicting various aspects of brucellosis eradication, were used at local shows and field days. The Department's film on brucellosis continued to be used in areas embarking on the final test-and-slaughter phase of eradication. It was also screened on television.

The dissemination of information to field staff included the *Brucellosis Newsletter*, literature surveys, slide sets, films and press releases.

Major producer and interest groups were addressed by senior staff and local extension field staff.

Carcass Classification

In conjunction with other State Departments of Agriculture and the Australian Meat and Livestock Corporation, the Department contributed to the preparation of material explaining the procedures of carcass classification.

The Department was involved in meetings with other organizations and in administrative activities aimed at the introduction of manual beef classification trials in New South Wales and the expansion of trials of manual pig carcass classification. These expanded trials will involve a wider coverage by the market reporting services.

Departmental officers formed part of a study group that assisted in an Australian Pig Industry Research Committee project aimed at the design of an electronic marketing system for selling pigs which is based on carcass classification. This system is being planned in such a way as to enable its use for marketing other livestock and agricultural products.

Beef Cattle Breeding and Improvement

Extension continued on the development of beef cattle breeding programmes to improve productivity.

A Senior Livestock Officer was transferred to the Animal Genetics and Breeding Unit, University of New England, Armidale, to act as State and national co-ordinator for field services of the National Beef Recording Scheme.

Meat Marketing

Division of Animal Industry officers were involved in specialist training in meat marketing to provide a basis for more widespread advice on marketing practice.

Objective Clip Preparation

This programme commenced in 1975 with the aim of furthering the acceptance of objective measurement throughout the wool-producing industry, and of educating woolgrowers in its use and implications. During the year, twenty-three workshops were conducted throughout the State, with a total attendance of 400 woolgrowers. Approximately 50 per cent of the total New South Wales wool clip was prepared to objective clip preparation standards in 1978-9.

Objective Measurement in Stud and Flock Sheep Breeding

The development and adoption of breeding programmes to improve the productivity of sheep flocks has been a continuing extension programme for many years. Most leading Merino studs in New South Wales now have wool production measurements on their reserve rams, and the number of studs that have production measurements on all rams is also increasing.

Pasture Legume Aphid

District agronomists continued providing monthly data on the incidence of spotted alfalfa and blue green aphids. The quick spread of these insects, and the dramatic nature of the damage caused, increased awareness of their importance among producers.

Control measures were readily accepted by producers and gave satisfactory, albeit expensive, control. Alternative legume species, such as woolly pod vetch, have been advocated by district agronomists.

Efficiency of Fertilizer Use on Pastures and Crops

Officers in coastal areas have participated in a scheme to record dairy farm performance. In most areas, analysis of farm records has shown the comparative advantage of farm-produced feed over purchased material. More critical management of fertilizer choice and application has reduced costs and/or increased farm income.

In tableland areas, higher product prices have set the stage for increased fertilizer application. Major demonstrations have shown the advantages of an increased rate of top dressing.

Co-operative work with fertilizer companies in the wheat belt involved a number of demonstrations. This work was assisted by the development of mobile sowing equipment for field use. A comprehensive mobile agronomy demonstration unit was developed for the north-west. Rapidly escalating costs of inputs such as fuel indicate the importance of efficient fertilizer use.

Pesticides Act, 1978

A series of press releases for State-wide distribution received support from country newspapers, and extension staff addressed meetings of producers and agents. The main thrust of the extension campaign will not be undertaken until enabling legislation has been passed.

Grain Pest Control

Departmental staff attended to eighty-one referrals involving infestations in grain. Good response was obtained from producers involved in major "clean-up" activities, and excellent co-operation with the Grain Elevators Board resulted in satisfactory control being achieved. Major infestations, however, occurred in the central/northern wheat belt.

A continuing information campaign drew attention to the grain pest problem, and demonstrations of grain handling and insect control measures at field days achieved producer response.

Livestock Market Reporting Service

Country officers continued the campaign to inform producers and the meat trade about the operations of the Livestock Market Reporting Service.

Additional staff were appointed, with the service now covering sales at Homebush, Wagga, Dubbo, Tamworth, Gunnedah, Lismore and Casino.

Excellent relationships have developed with the media, to which new-style reports are sent by market staff. Most private market reports are also in the new style.

Dairy Product Quality Assurance

A continuing quality-monitoring programme was conducted: 3 986 chemical and 3 504 microbiological analyses were completed on 1 215 samples. Results were reported to district officers for advice and, where necessary, remedial action.

Each milk powder manufacturing plant was monitored under the Salmonella Surveillance Programme, carried out in conjunction with the Health Commission. All samples were negative.

A total of 297 893 (25 kg) boxes of butter and 6 111 (19 kg) of cheese was organoleptically graded. Certificates were then issued to factories, as well as to dairy officers so as to enable them to do follow-up extension.

Dairy Herd Improvement Programme

The Department has agreed to use the Victorian system of proving dairy sires (Relative Breeding Value) to replace our own system (Relative Genetic Value), which has operated with little variation since 1963. The decision has been applauded by the Australian Dairy Farmers Federation,

This change of system is an interim measure to obtain greater uniformity across States, until such time as a more comprehensive and reliable system of bull and cow indexing is available from the National Scheme.

REGIONAL AND DISTRICT PROGRAMMES

More attention was given to programmes on farm business management which, as a percentage of the total number of programmes undertaken, increased from 7.9 per cent to 10.0 per cent. A movement towards the more efficient use of fertilizers was evident, with all areas of the State being involved in programmes of this nature.

Local programmes on farm business management covered: dairy farm performance reporting; the efficient use of fertilizers in bananas; economic feeding of pigs; cross-breeding of beef cattle; and the development of exotic fruit.

The conduct of farm management and farm office management courses proved to be of considerable assistance to producers.

Extension programmes

Subject of programme	Number of programmes
Production	544
Farm Business Management	97
Marketing	44
Regulatory	14
Environmental and Consumer Protection	20
Community Development	14
Programmes for Youth	39
Other	129

REGIONAL EXTENSION SERVICES

Extension Services

Farm visits	Number
One visit	10 101
Two visits	2 917
Three visits	1 291
Four or more visits	1 974
Total of farmers visited at least once	16 063

Group extension (excluding Rural Youth)	Total number	Attendance
Field days	1 126	48 607
Meetings	1 503	44 966
Courses, schools	248	8 610

Mass media output	Number
Articles for the <i>Agricultural Gazette</i>	28
Articles for <i>Dairy Topics</i>	17
Articles for State-wide journals and magazines	96
Press articles (original)	2 946
Radio broadcasts (original recordings)	2 696
Television programmes (original)	126
Issues of regional and district newsletters	263
Joint papers and articles with research workers	62
Regional or local bulletins or pamphlets	112
Contributions to research/extension liaison conferences	127

Veterinary services	Number
Property visits	12 488
Press releases	457
Contributions to newsletters	98
Radio broadcasts	132
Television programmes	22
Addresses to meetings	331
Field day sessions	78

RURAL YOUTH ORGANIZATION

The Organization's celebrations of its fiftieth anniversary included a State dinner, special field days, commemorative balls and reunions in country areas. A trend towards an increasing community involvement with the clubs was evident in coastal areas. The smaller number of young people now entering agriculture was reflected by the clubs' greater involvement in non-agricultural activities.

Rural Youth

	Total number
Rural youth clubs	165
Junior members	2 928
Senior members	657
Meetings, field days, etc.	1 325
People attending at educational activities	15 613
social functions	10 269
organizational functions	9 214
Farm or home visits by rural youth officers	1 490

Farm Management Course

The staff of the University of New England staff co-operated with the course, and enrolments in 1979 were: 102 for Level I; 35 for Level II; and 10 for Level III.

Farm Office Management Course

An intensive promotion campaign achieved an enrolment of 180 students. Regional workshops provided in-depth tutoring on bank reconciliation, depreciation, record-keeping and bank-loan allocations.

AGRICULTURAL BUREAU OF NEW SOUTH WALES

More than 4 000 head of cattle were judged in the Rural Bank/Agricultural Bureau-sponsored Beef Cattle Breeders Competition.

Officers provided technical information at Bureau field days, meetings and conferences.

Operation Farmlink involved the Bureau and district officers in an activity designed to improve urban/rural communications. On Farmlink Sunday, 5 000 city people visited farms, and 7 000 visited a special rural display at the Flemington Markets.

Agricultural Bureau

	Number
Agricultural Bureau branches	82
Members	2 500

RURAL ADJUSTMENT

Members of the Division of Extension Services increased their level of activity in the area of Rural Adjustment.

Seminars

A feature of the year was the conduct of a number of seminars for bank managers at Lismore, Cowra, Young, Dubbo, Scone and Walgett. A tour of the Namoi Valley introduced bankers to the variety of agricultural enterprises conducted in that area. These intensive irrigated row crop enterprises, requiring large inputs of capital and technology, demand high levels of managerial skill to achieve success.

Rural Directory

The production of a Rural Directory of Services available in the Hunter Valley has done much to meet the public demand for information. The Directory also gave the departments and agencies a better understanding of each other's roles, activities and capabilities.

Field Days

The North Coast Region conducted a series of weekend field days designed to cater for the needs of part-time and hobby producers who are unable to attend weekday functions because they work elsewhere during the week. There has been a continued movement of such producers into the

region, who have scanty agricultural knowledge and actively seek information. This influx of people with significant capital enabled small producers to move from the land with dignity and sufficient reserves for re-establishment elsewhere.

Careers Expo

The Rural Youth Organization has contributed to rural adjustment by conducting a careers expo in Sydney, running leadership schools in country centres and becoming involved, through its members, in various non-agricultural activities. These contributions, meeting a keen demand from rural youth and their parents, have equipped those involved with skills and knowledge necessary for urban living.

Lecture Tours

The Agricultural Bureau's organization of lecture tours gave members the opportunity to find out about such topical subjects as solar power, power alcohol production, land valuation changes, new marketing concepts and improved farm management.

EXTENSION PUBLICATIONS

The Division of Extension Services Head Office Section processed 234 different publications, including farmer bulletins, the *Agricultural Gazette of New South Wales*, news releases, *Poultry Notes*, *Dairy Topics* and *Technical Bulletins*.

The *Agricultural Gazette of New South Wales* is issued every two months; *Poultry Notes* and *Dairy Topics* are quarterly.

Overall design of extension publications is being revised to achieve a more readily recognizable Departmental uniformity. Also, more emphasis is being placed on briefer information sheets, which are quicker and cheaper to produce than multi-page leaflets.

A booklet of 100 pages summarizing pastoral research on the northern tablelands, was published with the aid of Commonwealth funds.

AGRICULTURAL ECONOMICS PUBLICATIONS

The *Review of Marketing and Economics* is a professional journal and contains research material from a wide range of sources. Three editions of the journal were published this year.

The monthly *Commodity Bulletin* contains commodity outlook and general extension material with a State-wide application. It has continued to be published on a monthly basis.

Miscellaneous bulletins, published on an irregular basis, contain research material produced by officers of the Division. Five editions were published in 1978-9.

Weekly Marketing Notes contain the weekly market reports of the Division, and 1 200 copies are distributed.

HOME GARDEN INQUIRIES

The home garden inquiry officers continued to provide an appreciated service to the public. The officers presented lectures to garden clubs and Agricultural Bureau branches. They also revised some existing publications and prepared material for new Departmental bulletins.

An inquiry centre set up at the Royal Agricultural Society Show in Sydney attracted many visitors.

Home garden inquiries

Year								Number of inquiries
1973-4	..	..	..	..	..	..	..	12 990
1974-5	..	..	..	..	..	..	..	16 692
1975-6	..	..	..	..	..	..	..	16 412
1976-7	..	..	..	..	..	..	..	16 738
1977-8	..	..	..	..	..	..	..	19 348
1978-9	..	..	..	..	..	..	..	
Telephone	..	..	..	..	..	..	..	14 752
Postal	..	..	..	..	..	..	..	912
In-person	..	..	..	..	..	..	..	2 106
Field officers	..	..	..	..	..	..	..	219
								17 989

LIBRARY SERVICES

The technical library service comprises collections under the care of librarians at the head office library, the Royal Botanic Gardens, the Biological and Chemical Research Institute, the Veterinary Research Station, the three agricultural colleges and the five research centres at which regional directors of research are located.

Other material is stored at regional extension headquarters, district offices and research stations throughout the State.

The library exists to inform officers of new developments in their field of expertise, to obtain information that they specify and to assist in staff development.

Current Awareness

Some 1 000 periodical titles are received by subscription, donation or exchange, and these are circulated to individuals and research stations.

A *Library Bulletin* is published in four series, in total about twenty-five issues a year. It notifies items newly received, ranging from books to pamphlets, annual reports and new periodicals, and carries copies of library reference items.

Reference and Research

Literature searches are carried out upon request but, generally, research workers prefer to do their own searches. Reference queries number in the thousands, some of which result in many loans being sought and photocopies obtained.

A core collection of journals, with elements of bibliographic control at the research stations, has been set up. This collection will supply quickly items requested by researchers and thus support work at the more isolated research stations.

Computer terminals will give access to data bases at CSIRO and the National Library. The central library maintains a union catalogue and plans are in hand to make this available to all research centres.

REGULATION AND TECHNICAL SERVICE

REGULATORY FUNCTION OF THE DEPARTMENT

The enforcement and implementation of statutory provisions is the function of Government. As such, the New South Wales Department of Agriculture has a basic function in—

- The control or eradication of plant and animal diseases.
- Ensuring quality standards in respect of agricultural products, especially foodstuffs and aids such as stock medicines, pesticides, etc.
- Maintaining standards of conduct in areas of activity associated with agriculture.

These powers and responsibilities are vested in the Department through various Acts and their Regulations.

Some officers perform regulatory activities together with other responsibilities. In addition, particular groups are appointed for specific regulatory functions: for example, meat inspection, cattle tick control, brucellosis eradication, plant disease regulation, and quarantine for import and export.

Regulatory work is a major activity in three Divisions of the Department, as indicated in the following section.

The Legal Section, in consultation with relevant Divisions, prepares legislation (including amendments to existing statutes), prepares information for prosecutions and appears on behalf of the Department in defended cases.

REGULATORY STAFF

The following table summarizes Departmental staff who are inspectors under an Act and who are directly involved in regulatory work. Many of the professional staff have a dual regulatory extension function.

Departmental regulatory staff as at 30th June, 1979

	Central Adminis- tration	Animal Industry	Dairying	Horticulture	Plant Industry	Biological and Chemical Research Institute	Total
Professional ..	6	54	25	4	0	2	91
Inspectors ..	4	1 139	0	135	3	0	1 281
Total ..	10	1 193	25	139	3	2	1 372

SUMMARY OF REGULATORY ACTIVITIES

Activities are listed under the following main Acts:

- *State Acts:* Agricultural Holdings Act, 1941; Agricultural Seeds Act, 1921; Apiaries Act, 1916; Cattle Compensation Act, 1951; Dairy Industry Act, 1915; Farm Produce Agents Act, 1926; Fertilizers Act, 1934; Horticultural Stock and Nurseries Act, 1969; Marketing of Primary Products Act, 1927; Meat Industry Acts, 1915 and 1978; Pastures Protection Act, 1934; Pest Destroyers Act, 1945; Pesticides Act, 1978; Plant Diseases Act, 1924; Potato Growers Licensing Act, 1940; Poultry Processing Act, 1969; Pure Food Act, 1908; Registration of Stock Brands Act, 1921; Stock (Artificial Insemination) Act, 1948; Stock (Chemical Residues) Act, 1975; Stock Diseases Act, 1923; Stock Foods and Medicines Act, 1940; Swine Branding Act, 1940; Swine Compensation Act, 1928; Veterinary Surgeons Act, 1923.
- *Commonwealth Acts:* Quarantine Act 1908; Customs Act 1901; Commerce (Trade Descriptions) Act 1905.

The following general activities were undertaken under the above-mentioned State Acts: prosecutions, 280; proclamations, 42; notifications, 36; and gazettal of appointments, etc., 45.

Agricultural Holdings Act, 1941

Two matters were referred to agricultural committees.

Agricultural Seeds Act, 1921

A total of 104 stores and 1 108 t of seed was inspected. Of 208 samples taken, thirty-nine were below standard and twenty-one warnings were issued. There were two prosecutions.

Apiaries Act, 1916

Restrictions continued on the movement of bees and apicultural products into New South Wales and on movement out of the area quarantined for European foul brood disease.

Cattle Compensation Act, 1951

Compensation was paid for 21 386 cattle ordered to be destroyed on account of suspected disease, and for sixty-three carcasses condemned during meat inspection.

Diseases on which claims were paid follow:

Disease	Claims	Cattle and carcasses
Brucellosis	610	21 039
Johne's disease	1	1
Tuberculosis	113	408
Tick fever	1	1
Total	725	21 449

Dairy Industry Act, 1915

The following activities were carried out:

Dairy factories registered	73
Dairy produce stores registered	174
Dairy factory and store inspections	294
Remedial orders issued	50

Certificates of competency issued—

Milk grading	56
Cream grading	0
Milk testing	21
Cream testing	15
Cheesemaking	1
Buttermaking	1

Farm Produce Agents Act, 1926

Licences were issued for 243 farm produce agents.

Fertilizers Act, 1934

528 fertilizers were registered; 16 warnings were issued and 17 un-registered products detected.

Horticultural Stock and Nurseries Act, 1969

There were 2 183 registrations of nurserymen and 2 080 of resellers.

Marketing of Primary Products Act, 1927

There were 12 marketing boards.

Meat Industry Acts, 1915 and 1978

The State Meat Inspection Service carried out ante-mortem and/or post-mortem inspections of livestock at thirty export establishments, six non-export abattoirs and at an increasing number of slaughterhouses throughout the State.

Inspection of carcasses and viscera

	Number inspected*
Adult cattle	2 867 862
Calves	288 171
Sheep, lambs and goats	8 314 883
Pigs	1 031 705

*Including inspections under the Commerce (Trade Descriptions) Act for export purposes.

The Meat Industry Act, 1978, was effective from 1st November, 1978, at which time all meat entering New South Wales became liable for re-inspection.

Re-inspection of meat from other States and New Zealand

	Number inspected
Beef	88 017
Calves	151 035
Sheep	263 171
Pigs	54 084
Piece meats (kg)	14 148 232

Pastures Protection Act, 1934

Sodium fluoracetate (1080) is only available for the destruction of vertebrate pests declared noxious under this Act. The use of 1080 for wild pig destruction was authorized by the Director-General of Agriculture for all pastures protection boards, subject to the employment of a qualified officer. Ministerial approval for aerial baiting with 1080 for wild dog control was given for sixteen separate drops.

Rabbit control is administered by the Department and organized by pastures protection boards.

Prosecutions under this Act were undertaken by pastures protection boards in their own right.

Pest Destroyers Act, 1945

Applications were received for 553 new products, 401 amendments to existing labels and 994 annual re-registrations.

Pesticides Act, 1978

Regulations for the implementation of this new Act were drafted.

Plant Diseases Act, 1924

Inspections in districts

	Number inspected
Orchards, plantations, vineyards	14 580
For planting statistics only	1 061
Fruit shops and stalls	4 258
Home gardens	26 204
Grain storages and processing premises	1 004
Notice issued for pest and disease control	204

Inspection at markets

								Detention notices for non-compliance with grading, packing or labelling regulations	
								Bulk bins	Packages
Apples	..	..	..	..	..	..	..	12	6 278
Pears..	..	..	..	..	..	..	..	..	16 752
Citrus	..	..	..	..	..	..	..	72	8 773
Grapes	..	..	..	..	..	..	..	..	3 908
Bananas	..	..	..	..	..	..	..	..	2 270
Tomatoes	..	..	..	..	..	..	..	..	1 138
Rockmelons	..	..	..	..	..	..	..	..	9 423
Potatoes	..	..	..	..	..	..	..	..	19 977
Vegetables	..	..	..	..	..	..	..	..	2 177
Castaway certificates	..	..	..	..	..	..	..	..	3 150

There were thirty-three successful prosecutions.

Potato Growers Licensing Act, 1940

There were 684 registrations of potato growers and 306 inspections of properties.

Poultry Processing Act, 1969

The 103 registered poultry processing plants were inspected, involving 700 visits.

There were twelve prosecutions for excessive water uptake.

Pure Food Act, 1908

The Department, in conjunction with the Health Commission of New South Wales, inspected all New South Wales milk-drying plants to ensure all equipment can produce *Salmonella-free* milk powder.

There were thirty-two prosecutions for offences relating to transportation of meat.

Registration of Stock Brands Act, 1921

								Number registered	
Brands for large stock	..	..	..	..	..	..	..	1 571	
Sheep ear marks, colour brands and fire brands	..	..	..	..	..	..	..	2 177	

Stock (Artificial Insemination) Act, 1948

Two artificial breeding centres were registered in New South Wales for the production of licensed bovine semen. Four premises were registered as sub-centres for holding and distribution of semen.

Certificates of Competency to inseminate cows were issued to thirty-two persons. One certificate for supervision of a sub-centre was issued.

Stock (Chemical Residues) Act, 1975

Samples of fat collected from cattle slaughtered at nineteen abattoirs were analysed for the presence of chemical residues. Cattle found to exceed the maximum residue limit (MRL) were detained on six properties. Five properties were under detention orders on 30th June, 1979.

Analysis of 10 502 samples showed that 78 per cent were free of all residues and 0.6 per cent was above the actionable level.

Pesticide residues in samples from New South Wales cattle, 1978-9

Residue							Number of samples			
							Above MRL	50-100 per cent MRL	Below 50 per cent MRL	Total
DDT*	..	..	..	..	..	5 ½	17	33	2 230	2 280
Dieldrin*	..	..	..	..	..	0.2	28	34	47	109
HCB	..	..	..	..	..	0.5	..	..	..	1
No residue	..	..	..	..	..	..	..	..	..	8 146

*Thirty-three samples contained traces of both DDT and dieldrin.

Regulatory activity in the control of brucellosis and tuberculosis in cattle is summarized in the standard format adopted for the National Brucellosis and Tuberculosis Eradication Campaign, but does not include miscellaneous testing carried out in Residual Areas.

Bovine brucellosis for New South Wales

	Number
Herds	69 904
Dairy herds	3 874
Breeding animals	4 804 910
Monitoring	
Abattoirs	
Females slaughtered	1 472 753
Bulls slaughtered	65 436
Blood samples collected	435 219
Confirmed reactors	6 902
Confirmed reactors	(1.6%)
Herds in which reactors were found	3 197
Milk ring testing (MRT)—	
Herds checked	3 718
Positive MRT herd tests	1 103
MRT herds blood tested	1 018
Abortion investigations	
Herds investigated	299
Positive investigations	32
Field testing (6%, or routine, or sample)	
Herds tested	2 802
Cattle tested	58 522
Reactors	1 212
Total monitoring	
Herds tested	41 883
Herds positive	3 604
Cattle tested	493 741
Reactors	8 114
Eradication	
Infected herds during year	6 189
Herds tested during year	20 629
Blood samples tested	3 412 200
Reactors	18 775
Disposal of reactors	
Reactors for which compensation paid	20 895
Net compensation paid	(\$1,243,060)
Vaccination	
Cattle vaccinated with Strain 19	396 041
Doses of Strain 45/20 used	4 933
Laboratory	
Blood samples tested	3 785 210
Serological tests	4 956 213
Bacteriological accessions	200

	1st July, 1978		30th June, 1979	
	Number	Per cent	Number	Per cent
Infection data				
Herd Status				
Not assessed	57 302	76.5	35 554	49.4
Suspect	1 943	2.6	2 810	4.0
Infected	3 344	4.5	3 446	4.9
Restricted	1 849	2.5	2 789	4.0
Provisionally clear	481	0.6	2 593	3.7
Tested negative	9 445	12.6	19 972	28.6
Monitored negative	267	0.4	260	0.4
Confirmed free	250	0.3	3 475	5.0
Accredited free	2	0.0	5	0.0
Prevalence				
Herd			(9.8%)	
Individual			(0.2%)	

Bovine tuberculosis for New South Wales (provisionally free area)

													Number
Herds	..	..	..	..	..	..	..	..	..	..	..	..	68 731
Cattle	..	..	..	..	..	..	..	..	..	..	..	..	8 008 175
Monitoring													
Abattoirs													
Adult cattle slaughtered	..	..	..	..	..	..	..	..	..	..	..	..	2 867 862
With TB lesions (presumed plus confirmed)	..	..	..	..	..	..	..	..	..	..	..	..	96
Successful tracebacks to herd of origin	..	..	..	..	..	..	..	..	..	..	..	..	93
Successful tracebacks	..	..	..	..	..	..	..	..	..	..	..	..	(96.9%)
Testing													
Cattle tested	..	..	..	..	..	..	..	..	..	..	..	..	27 947
Reactors	..	..	..	..	..	..	..	..	..	..	..	..	89
Herds tested	..	..	..	..	..	..	..	..	..	..	..	..	255
Herds confirmed infected	..	..	..	..	..	..	..	..	..	..	..	..	10
Herds tested from abattoir traceback	..	..	..	..	..	..	..	..	..	..	..	..	69
Eradication													
Infected herds	..	..	..	..	..	..	..	..	..	..	..	..	138
Herds tested	..	..	..	..	..	..	..	..	..	..	..	..	124
Cattle in infected herds	..	..	..	..	..	..	..	..	..	..	..	..	46 640
Individual cattle tests	..	..	..	..	..	..	..	..	..	..	..	..	57 940
Reactors	..	..	..	..	..	..	..	..	..	..	..	..	338
Disposal of reactors													
Reactors detected	..	..	..	..	..	..	..	..	..	..	..	..	409
Reactors slaughtered	..	..	..	..	..	..	..	..	..	..	..	..	406
Reactors autopsied (abattoir and field)	..	..	..	..	..	..	..	..	..	..	..	..	406
Reactors with lesions	..	..	..	..	..	..	..	..	..	..	..	..	203
Reactors for which compensation paid	..	..	..	..	..	..	..	..	..	..	..	..	142
Casual cases for which compensation paid	..	..	..	..	..	..	..	..	..	..	..	..	8
Net compensation paid	..	..	..	..	..	..	..	..	..	..	..	..	(\$10,338)
Laboratory													
Bacteriological accessions	..	..	..	..	..	..	..	..	..	..	..	..	249
With confirmed tuberculosis	..	..	..	..	..	..	..	..	..	..	..	..	183
Infection data													
Herds infected at beginning of year	..	..	..	..	..	..	..	..	..	..	..	..	60
Cattle in infected herds at beginning of year	..	..	..	..	..	..	..	..	..	..	..	..	22 105
Herds infected at end of year	..	..	..	..	..	..	..	..	..	..	..	..	56
Cattle in infected herds at end of year	..	..	..	..	..	..	..	..	..	..	..	..	18 981
Prevalence													
Herd	..	..	..	..	..	..	..	..	..	..	..	..	(0.08%)
Individual	..	..	..	..	..	..	..	..	..	..	..	..	(0.0008%)

Diseases for which quarantine was applied

Disease										Number quarantined	
										Properties	Stock
Anthrax	..	..	..	..	..	..	..	..	..	8	16 213
Lice in sheep	..	..	..	..	..	..	..	..	..	999	1 669 451
Ked in sheep	..	..	..	..	..	..	..	..	..	3	730
Lice and ked in sheep	..	..	..	..	..	..	..	..	..	1	1 000
Tuberculosis in cattle	..	..	..	..	..	..	..	..	..	138	..
Tuberculosis in pigs	..	..	..	..	..	..	..	..	..	4	..
Tuberculosis in poultry	..	..	..	..	..	..	..	..	..	15	..

Quarantine for brucellosis in cattle in the test and slaughter eradication areas was applied to about 6 000 herds.

Cattle tail tags

										Number
New applications by occupiers	..	..	..	..	..	..	..	..	..	3 538
Transfers by occupiers	..	..	..	..	..	..	..	..	..	1 835
Applications by non-occupiers	..	..	..	..	..	..	..	..	..	242
Application for exemption	..	..	..	..	..	..	..	..	..	60

Prosecutions under Stock Diseases Act

Reason	Number
Tail tagging	19
Lice in sheep	27
Footrot in sheep	1
Border crossing	3
Swill feeding of pigs	2
Illegal movement	3
Assaulting an Inspector	1
Total	46

Stock Foods and Medicines Act, 1940

Registration of stock medicines by the Stock Medicines Board numbered as follows: 1 400 re-registrations, 221 new registrations, 8 refused and 23 investigations.

Registrations of stock foods numbered 1 435. There were 7 investigations and 1 prosecution.

Swine Branding Act, 1940

There were 842 brands allotted and transferred. There was 1 prosecution for failure to brand.

Swine Compensation Act, 1928

Compensation was paid for 41 pig carcasses condemned during meat inspection.

Diseases for which claims were paid

Disease	Number of claims	Number of carcasses
Tuberculosis	5	35
Septicaemia	6	6

Veterinary Surgeons Act, 1923

The Veterinary Surgeons Board approved the registration of 1 273 veterinary surgeons. There were sixty-six investigations into complaints against veterinary surgeons. The Veterinary Investigations Committee investigated twelve new complaints for professional misconduct, all of which were dismissed. There was one prosecution for a breach of regulations concerning advertising.

Quarantine Act, 1908-73 (Commonwealth)

On behalf of the Commonwealth Government, the New South Wales Department of Agriculture administered sections of this Act relating to the importation of plants and animals and their products.

Activities under Quarantine Act

	Number	
	Plant	Animal
Prosecutions—		
Quarantine Act (Commonwealth)	2	1
Customs Act (Commonwealth)	63	44
Both Acts	79	41
Quarantine—		
Fees collected	(\$830 867)	(\$67 516)
Passenger clearance		
By sea—		
Vessels met	192	192
Passenger arrivals	77 744	77 744
Quarantine interceptions	2 412	2 412
By air—		
Flights met	8 329	8 329
Passenger arrivals	1 169 187	1 169 187
Quarantine interceptions	67 737	67 737
Parcels post		
Parcels examined	15 785	5 289
Parcels needing quarantine action	3 519	755

Plant quarantine

	Number
Import permits issued	51 189
Cargo	
General	
Vessels attended	582
Seed sampled for examination	689
Vehicles steam cleaned	2 906
Containerized cargo	
Vessels plying Sydney port	204
Containers discharged	136 077
Action on containers*	
FCL's immediate delivery	79 104
FCL's and LCL's depot inspection	53 978
FCL's country inspection	1 558
FCL's city approved premises	1 437
FCL follow-up inspections	1 485
revealing infringements	167
International airport terminal	(60 798 t)
Richmond RAAF terminal	(6 789 t)
Timber imports	(565 323 m ³)
Quarantine treatment	(7 585 m ³)
Approved premises for processing	116
Personal effects examined (consignments)	4 016
Personal effects quarantined (consignments)	620
Nursery stock	
Total imports (items)	38 378
Ornamentals to approved quarantine houses	33 221
Plant quarantine station	
Seeds for Department and universities	231
Seeds for private imports	11
Fruit trees for Department	46
Plants for private importers	5 157
Exotic pest interceptions (occasions)	
Giant African snail <i>Achatina fulica</i>	13
Khapra beetle <i>Trogoderma granarium</i>	1
Carpenter ants <i>Camponotus pennsylvanicus</i>	4
Drywood termites <i>Cryptotermes</i> sp.	1
Siricidae spp.	30
Warehouse beetle <i>Trogoderma variabile</i>	3
Exotic fruit fly <i>Dacus passiflorae</i>	1
Exotic snail <i>Polygyra spetomvolva</i>	1

*FCL, full container load; LCL, less than full container load.

Animal quarantine

	Number
Permits issued	1 844
Animals landed	
Domestic livestock	2 102
Animal pets	1 456
Aquarium fish	3 289 630
Others	5 159
Animals entering quarantine	
Dogs and cats	340
Horses and donkeys	296
Semen imported	
Cattle (doses)	15 366
Dog (doses)	50
Animal product imports	
Landings permits issued	2 205
Main products landed	
Tinned meats	525 218 kg
Chilled/frozen meat	913 785 kg
Cheese	4 519 637 kg
Fish products	2 503 025 kg
Wool	1 104 657 kg
Fish meal	485 527 kg
Stock feed	290 416 kg
Ship's pets	
Animals bonded	430
Fish bonded	4 426
Animal exports	
Health certificates issued	3 333
Main exports	
Domestic livestock	14 153
Animal pets	2 561
Birds and poultry	841
Day-old chickens	542 378
Hatching eggs	166 540
Others	5 067

Commerce (Trade Descriptions) Act, 1905 (Commonwealth)

The items exported under the export regulations were inspected and health certificates endorsed with treatments supervised for importing countries.

Grain inspected under Act

	Tonnage	
	Inspected	Rejected
Ships surveyed for grain export (number)	(85)	(38)
Wheat	1 757 289	2 140
Sorghum	24 500	
Barley	99 905	
Flour	28 808	1 235
Oats	17 756	

Fresh fruit and vegetables inspected under Act

	Number of packages*	
	Inspected	Rejected
Apples	179 832	9 840
Pears	232 439	3 311
Citrus	60 983	3 299
Stone fruit	62 196	3 323
Grapes	45 308	1 012
Strawberries	4 852	..
Other fruits	82 967	..
Tomatoes	29 963	..
Potatoes	34 039	440
Onions	52 889	..
Garlic	2 303	..
Other vegetables	19 754	122

* Includes 173 containers loaded and inspected at country centres.

SUMMARY OF LEGISLATIVE ACTIVITIES

The following legislation was undertaken:

- Acts
 - Dairy Products (Repeal) Act, 1979
 - Meat Industry (Amendment) Act, 1978
 - Prickly-Pear (Amendment) Act, 1978
 - Registration of Stock Brands (Amendment) Act, 1979
 - Statutory and Other Offices Remuneration (Amendment) Act, 1979
 - Wheat Industry Stabilization (Amendment) Act, 1978
 - Wine Grape Processing Industry Act, 1979
- Regulations: number of Amendments
 - Cattle Compensation Act, 1951 2
 - Chicken Meat Industry Act, 1977 1
 - Dried Fruits Act, 1939 2
 - Egg Industry Stabilization Act, 1971 1
 - Grain Elevators Act, 1954 1
 - Horticultural Stock and Nurseries Act, 1969 1
 - Marketing of Primary Products Act, 1927 6
 - Meat Industry Act, 1978 6
 - Noxious Insects Act, 1934 1
 - Pastures Protection Act, 1934 7
 - Plant Diseases Act, 1924 4
 - Potato Growers Licensing Act, 1940 1
 - Prickly-Pear Act, 1924 1
 - Stock Diseases Act, 1923 5
 - Veterinary Surgeons Act, 1923 1
- By-Laws: number of Amendments
 - Meat Industry Act, 1978 1

DISEASE AND PEST CONTROL—REGULATORY

Brucellosis and Tuberculosis in Cattle

The funds available for the National Brucellosis and Tuberculosis Eradication Campaign were significantly increased in 1978-9. Slightly in excess of \$8.7 million was available including \$6 million from the Commonwealth and just over \$2.7 million from the State.

Brucellosis: Increased funding enabled further marked progress to be made. Test and slaughter provisions were implemented in a further 23 pastures protection districts by late in the year, so that 45 of the State's 59 pastures protection districts are now actively involved in eradication. This involves some 4 million breeding cattle in 57 000 of the State's 70 000 herds. The entire coast, tableland and western areas along the borders with Queensland and Victoria are involved.

The thirteen areas gazetted as "special", to enable restrictions to be applied to entry of cattle, reached provisional freedom by the end of the year. These areas comprise the north-eastern sector of the State and include the District Veterinary Officer areas of Armidale, Grafton and Newcastle.

Of the 3 412 200 blood samples collected from 20 629 herds undergoing test and slaughter, only 0.6 per cent recorded positive reactions, and the average level at initial testing of these herds was 1.1 per cent. In 1977-8, 2 334 208 samples were collected from 16 207 herds.

Outlets were found for virtually all of the 21 000 brucella reactors detected (28 000 in 1977/78), and the average payout for compensation was about \$59 per head (\$57 in 1977/78).

Laboratory testing increased to 4.96 million (from 3.8 million in 1977-8).

Strain 19 vaccination declined further to 396 000 (from 455 000 in 1977-8), due largely to de-emphasis of vaccination in the latter part of the year on the north coast, northern tablelands and Hunter Valley regions as a result of very favourable progress in these areas.

Tuberculosis: New South Wales remains provisionally free of tuberculosis in cattle. Additional small gains were made towards achieving total freedom status. Prevalence levels for the State were 0.08 per cent on a herd basis and 0.00075 per cent on an individual cattle basis (0.09 per cent and 0.0008 per cent respectively in 1977-8).

Field testing involved about 80 000 individual tests (110 000 in 1977-8), for 409 reactors (500 in 1977-8), of which 50 per cent revealed lesions on slaughter. Once again, the decreasing number of field tests required emphasizes the economic advantages of the reliance on tail-tag traceback rather than routine area testing.

Bunchy Top Control in Bananas

The bunchy top figure for 1978-9 was 1 060. This is a dramatic decrease from the figure for last year and is the lowest for 8 years. It is due to climatic conditions and to the destruction of many bunchy-top-infected plantations last year. No bunchy top was detected in the Richmond District or farther south.

The Government agreed to provide \$20,000 annually for the next three years to implement an additional scheme for the control and eradication of the disease, on the understanding that the banana industry contributes \$10,000 annually.

Fruit Fly

The Murrumbidgee and Murray Irrigation Areas remained free of fruit fly, with only one fly being trapped at Narrandera. Fruit fly activity in the rest of the State was low, with only moderate infestations in the coastal and northern regions.

The fruit fly eradication/suppression programme in south east Australia, as agreed to by the Australian Agricultural Council, has not proceeded because the Commonwealth declined to take part in funding the scheme. A working party set up under the aegis of the Standing Committee on Agriculture is considering a series of alternatives based on the original model.

Grain Pests

The second year of the traceback programme was successfully completed. Those wheat growers delivering insect-infested grain to the bulk handling authority were referred to the Department and inspections made of their properties. Although the properties were scattered throughout the wheat belt, the major centres requiring inspection were in the Gilgandra, Gulargambone and Coonamble districts. On only two farms were inspectors able to report that grain handling and storage facilities were free of insect pests. Sixteen farms had very poor standards of hygiene, and their owners were instructed to implement major clean-up programmes. Of the remaining sixty-three referrals, only minor farm hygiene operations were necessary. Generally, farmers responded most satisfactorily to the programme and there has been excellent co-operation from the Grain Elevators Board of New South Wales.

Warehouse Beetle

It now appears that the eradication programme has not been as successful as had been hoped. The warehouse beetle is no longer only in the rice mill system; it has been found in several other

premises in the Griffith area and at a seed-handling firm in Sydney. A wide-ranging search is being made of farms and businesses to ascertain the extent of this pest's establishment.

Weeds

Water Hyacinth: The eradication of water hyacinth in the Gingham Watercourse near Moree has proceeded most satisfactorily. With financial support from the Commonwealth, South Australian and Victorian Governments, the infestation has been reduced to seedlings only, of which very few survived at the end of the year. Water management has progressed, enabling rapid drying out of the area after floods and the ready provision of stock water to landholders.

Johnson grass: The Government made available special noxious plant grant funds of \$75,000 to local government bodies in the Macquarie and Gwydir River Valleys for the control of this weed. These funds were used both to continue existing programmes and to initiate new ones. An increased level of community interest and involvement is now evident in some of these areas.

Noogoora burr: Pressure to increase activity against this weed, particularly along the Murray River and other streams in the Riverina and Western Division, has continued from Victoria and South Australia. Work by the local councils in the area has been encouraged by increased grants.

Weevil Borer of Bananas

Banana weevil borer has continued to spread through the Nambucca and Coffs Harbour districts. This was particularly so in the Nambucca area, where the pest has been found in previously uninfested areas.

Plague Locust Control

The spring campaign organized by the Department and pastures protection boards terminated most Australian plague locust activity in central and southern New South Wales before Christmas, 1978. This campaign commenced in mid-October and concluded in late December. However, in mid-March further invasions infested some 15 000 properties in thirty pastures protection districts, from the Queensland to Victorian borders west of the Great Dividing Range.

Insecticide used by the Department was aimed at the destruction of hopper bands. The heaviest infestations were within a radius of 40 km of West Wyalong. This involved parts of the Condobolin, Narrandera, Wagga and Young pastures protection districts. Infestations were also found and treated in parts of Canonba and Coonamble pastures protection districts.

Total use of insecticide by pastures protection boards, property owners and the Department.

Insecticide						Total area treated (ha)	Amount insecticide used (L)
Maldison emulsion..	..	..	..	..	..	13 000	16 480
Maldison technical	..	..	..	..	..	5 974	3 346
Fenitrothion technical	..	..	..	..	..	7 500	3 000

Argentine Ant Eradication Campaign

The Director, Pesticides and Environmental Studies, assumed an administrative and advisory role in the Argentine Ant Eradication Campaign, which is jointly carried out with local government. Departmental staff were involved in the campaign activities.

Infestations						Number	
New found by—							
staff	..	..	..	..	..	2	
publicity campaign	..	..	..	..	..	4	
Persisting	..	..	..	..	..	..	
Re-infestations	..	..	..	..	..	..	

Spraying						Area (ha)	
Total	..	..	..	..	..	57.3	
Spot sprayed	..	..	..	..	..	3.1	
(Number of areas spot sprayed)	..	..	..	..	..	(5)	

Surveying	Area (ha)
Check survey	33.2
(Number of properties surveyed)	(3 551)

CATTLE TICK AND TICK FEVER CONTROL

Control of cattle tick (*Boophilus microplus*) within the infested area in the north-east of New South Wales is exercised by the Board of Tick Control under the jurisdiction of the Department of Agriculture. The infested country embraces a number of quarantine areas from and within which the movement of stock is controlled.

Twenty-one infestations were detected during 1978-9 (52 in 1977-8) and one holding was infected with tick fever out of a total of 6 489 in the Tick Quarantine Area (TQA).

For the second successive year since 1974, all holdings in the TQA were involved in either a dipping or examination programme: 4 646 holdings with 416 402 cattle in Casino and the northern part of the area underwent five to nine treatments, all commencing in October, and 1 840 holdings with 170 892 cattle in Cullendore and the southern sections underwent one to two examinations, commencing in February.

Eight infestations were detected in the strategic planned dipping areas and thirteen infestations in the southern area not subject to an annual dipping programme. No infestations were recorded in Cullendore.

Seventeen holdings were given additional treatments or examinations due to serious breaks in the programme. Of these, two were subsequently found infested.

Quarantine over the Jackybulbyn Special Area was lifted on 30th June, 1979, following detection of seven ticks on two head of cattle in March, 1978. A serious view of this was taken due its proximity to the southern external boundary.

A major policy change for adjoining holdings within the dipping area was made. Treatments were reduced to only four clean dippings, with quarantine still maintained for ten months and four examinations required during the following two active tick seasons.

Organophosphorus (OP) resistance testing revealed the presence of Biarra, Ridgeland, Mt Alford, Ingham and Tully or Mackay strains, whilst one sample was 100% OP susceptible.

About 735 dips charged with Taktic ® were used for policy, infestation, movement and voluntary treatments, involving 2.6 million individual dippings; 293 dips were charged with Promicide ® and twelve with Tifatol ®. Safeguarding of about a hundred dips was completed.

The laboratory of the Board of Tick Control at Lismore carried out 17 325 acaricide and lime estimations and 6 782 hair, pH and mud estimations on dip samples. Analyses on 114 samples were done for residues in addition to analyses for the State-wide pesticide residue survey.

Major activities

Activity	Number		
	Cattle	Horses	Carcasses
Examinations	2 267 290	33 008	645 000
Dippings	2 934 191	1 399	
Sprays	24 121	30 152	
Policy examinations	320 937		
10% examinations	298 343		
Stock movement control	2 082 577	16 716	

Vehicular movement through gates: 6.2 million vehicles.

Queensland Border Control

To prevent cattle ticks from entering New South Wales, control was maintained on the introduction of livestock, plants and some animal products from States where the parasite exists. Inspectors located on the Queensland border supervised the entry from Queensland of 489 402 cattle, 376 889 sheep, 32 370 pigs, 7 979 horses, 1 035 goats and 156 other animals.

TECHNICAL SERVICES

Market Reporting, Crop and Livestock Reviews and Forecasts

The Division of Marketing and Economics continued to collect and disseminate market information.

- Daily: Reports covering supplies, demand, quality, prices and price movements at the Sydney Farm Produce Market for fruit, vegetables and cut flowers, and various markets for cattle, sheep and pigs.

Records of retail prices of fruit, vegetables, fish and meat at various retail outlets throughout the metropolitan area.

- Weekly: Reports on wholesale prices for grain, butter and cheese, bacon and ham, honey bran, pollard and eggs.
 - Monthly: Reports on the wholesale and retail prices of various stockfeeds, and wholesale prices of dressed poultry.
- Publication of Cool Storage Statistics covering the quantities of apples and pears held in cool and controlled atmosphere storages throughout New South Wales.

The Livestock Market Reporting Service was expanded to provide reports from sales at Homebush, Wagga, Dubbo, Tamworth, Gunnedah, Lismore and Casino.

The wheat, oats and barley crop forecasts are now undertaken by the Division of Plant Industry, and citrus forecasts by the Division of Horticulture, with assistance from the Division of Marketing and Economics.

Publication continued of the monthly report on Production Trends, which included a summary of seasonal conditions and comments on the seasonal progress and production prospects for over twenty of the more important crops grown in New South Wales. Also included were details of monthly slaughtering and production figures for cattle, sheep, lambs and pigs, as well as production figures for butter, cheese, milk and eggs, and wool receivals and sales through brokers' stores. The monthly survey of New South Wales Pastoral Conditions continued to report on seasonal conditions, the pasture and feed situation, the condition of stock and the noxious pest problems in over fifty districts of the State.

Pesticides and Environmental Studies

Studies include the review, development and co-ordination of research and extension programmes relating to pesticide residues and other environmental problems, and are undertaken in collaboration with Departments and Authorities of the Commonwealth, New South Wales and other States.

Drought/Bushfire Relief

The Department administered the following drought relief schemes: road freight concessions, water cartage and cattle slaughter compensation.

The serious drought that was experienced during 1977-8 ended by October, 1978. However, the north-west area had a dry summer and autumn, and ten pastures protection districts were affected by drought in June, 1979.

Following serious bushfires in southern areas in February, 1979, rail and road freight concessions on movement of livestock and fodder, and low-interest loans, were made available in affected areas.

Animal Health Diagnostic Services

Intake of consignments of specimens to Departmental veterinary laboratories increased by 37 per cent over the previous year. This was a general increase occurring over all species and over all sources. In addition to those tabulated below, there were about 49 000 specimen consignments associated with the National Brucellosis Eradication Campaign.

Origin and source of specimen consignments*

	Number					
	Glenfield	Armidale	Wagga	Wollongbar	Total	Per cent
Cattle	9 168	640	699	1 280	11 787	49
Sheep	2 749	632	1 242	0	4 623	19
Pigs	654	183	315	310	1 462	6
Poultry	804	169	59	90	1 122	5
Other animals	1 802	973	568	1 330	4 673	19
Other specimens	198	16	4	159	377	2
Private practitioners	5 488	1 427	1 435	1 579	9 929	41
Veterinary inspectors	4 434	477	813	630	6 354	27
Departmental officers	5 259	473	557	952	7 241	30
Others	194	236	82	8	520	2
Total	15 375	2 613	2 887	3 168	24 043	100

* Not including those directly concerned with the Brucellosis Eradication Campaign.

Dairy Product Quality Assurance

The Department took 1 215 samples of New South Wales, interstate and imported dairy products, which were subjected to 3 986 chemical and 3 504 microbiological tests. A total of 297 893 (25 kg) boxes of butter and 6 111 (19 kg) boxes of cheese was graded.

Least-Cost Feed Formulation Service

This service, based on a computer program at Seven Hills Poultry Research Station, experienced high demand from egg producers.

Livestock Recording Services

The Department operated the following services:

- A dairy herd recording service on 793 farms. The numbers of cows recorded under the Official and Group Schemes were 11 842 and 48 786, respectively.
- A fleece measurement service, based on Trangie Agricultural Research Station, which processed 24 706 wool samples from 101 studs.
- A corrected weaning weight service for British breed sheep studs.
- An on-farm pig performance recording scheme.
- A random sample layer test which continued to attract entries from three States. Information was supplied on the production potential of all major local strains of poultry.

Sheep Fertility Service

This service operated from Wagga and undertook seventy property visits.

Public Watering Places

The Department spent \$140,000 on the maintenance and improvement of public watering places on stock routes in the Western Division. In addition, further maintenance work was carried out by Department field officers and with rental money.

Plant Health Diagnostic Services

The Biology Branch at the Biological and Chemical Research Institute, Rydalmere, examined 1 236 plant specimens for disease, and 494 samples for parasitic nematodes. There were 346 mushroom culture and disease control inquiries, over 1 600 specimens were added to the herbarium and 45 new plant diseases were recorded.

The Entomology Branch made 2 722 identifications of insect and mite pest problems of plants and plant products, and added 4 969 specimens to its collection.

Chemistry Branch Services

The following services were provided from the Biological and Chemical Research Institute and from regional laboratories.

Service	Number of samples	Number of analyses
Plant analysis	27 511	109 275
Soil chemistry	16 345	115 317
Soil physics	1 322	5 718
Fertilizer analysis	135	384
Water analysis	613	6 756
Stock feed analysis	2 403	7 726
Oilseed analysis	1 031	3 155
Biochemical assays	1 529	2 491
Pesticide analysis	722	3 466
Cereal quality evaluations	6 365	29 940
Nutritional diagnoses/recommendations	3 323	
Water quality assessments	602	

Botanical Services

The Royal Botanic Gardens and National Herbarium identified 10 108 plant specimens, answered 4 559 inquiries and sent 3 581 herbarium specimens on exchange.

Certified Seed Production

Pasture seed produced totalled 1 788.4 t and included: 1 191.1 t subterranean clover; 28.4 t annual medics; 45.1 t Hunter River lucerne; 17.5 t other lucernes; 54.6 t white clover; 2.9 t other legumes; 117.8 t Kangaroo Valley ryegrass; 110.2 t Tama ryegrass; 114.8 t phalaris; 53.5 t cocksfoot;

10.6 t tall fescue; 33.9 t kikuyu. Also produced were 400.9 t lupins, 117.8 t certified maize and 1.8 t foundation maize. The 147 ha of seed potatoes inspected all met certification requirements.

Seed Testing

The seeds Laboratory tested 7 403 seed samples. Of these, 1 030 were for quarantine, 237 for regulatory, 771 (including 475 pasture, 217 maize and sorghum, and 79 lupin samples) for certification purposes. For industry, 1 174 miscellaneous samples were tested; there were no rice samples. For Departmental purposes, 1 669 seed samples and 774 registered cereal seed were tested and 100 samples were tested for other Departments. For identification, 160 seed specimens were submitted and 1 488 wheat samples were germination tested for the Australian wheat collection.

Australian Inoculants Research and Control Service

This service was established and is financed by the Australian Agricultural Council to control the quality of legume inoculants prior to release and to test the standard when available at retail outlets in all States. A total of 165 cultures were tested during production, and of these samples 127 were passed. All of the 189 packeted inoculants tested from retail outlets reached the necessary standard.

EDUCATION

Through its certificate-level colleges at Yanco (Yanco Agricultural College) and Paterson (C. B. Alexander Agricultural College), the Department of Agriculture provided vocational education for prospective farmers and managers aspiring to establish themselves in careers on the land or in related service industries. Orange Agricultural College continued to provide tertiary courses specifically related to farming and the rural industry, with emphasis on rural business management and farm secretarial studies.

The administration of the Department's activities in the field of agricultural education is undertaken by the Agricultural Education Secretariat, which was established for this purpose in 1970. Following a series of reviews conducted by the Department of the structure and establishment of the Secretariat, it was attached to the Division of Extension Services on 4th September, 1978. This administrative change was designed to bring the Department's certificate colleges in close contact with related activities in education and extension and, in consolidating the Department's educational functions, will assist with its present initiatives towards close co-operation with the rural studies sector of the Department of Technical and Further Education.

During the year, 9 451 students attended educational tours of the Royal Botanic Gardens, which were conducted by the Education Officer. Many teachers were given in-service courses so that they could effectively conduct their own classes on educational tours of the Gardens. Guided tours were given to groups of senior citizens during Senior Citizens week and a programme of guided tours for members of the public was instituted. The administration and control of the Royal Botanic Gardens was transferred from the Department to the Premier's Department on 30th March, 1979.

STUDENT STATISTICS

Colleges and courses	Enrolment		Final examination	
	1978	1979	Sat	Passed
Orange Agricultural College—				
Associate Diploma in Farm Management—				
1st year	53	47	43	36
2nd year	34	36	32	31
Associate Diploma in Farm Secretarial Studies—				
1st year	24	42	16	14
2nd year	25	14	22	22
Total:	136	139	113	103
C. B. Alexander Agricultural College—				
Certificate in Agriculture	75	85	70	62
Advanced Certificate in Agriculture	56	55	55	50
Total:	131	140	125	112
Yanco Agricultural College—				
Certificate in Agriculture	60	69	52	50
Advanced Certificate in Agriculture	6	7	4	4
Advanced Certificate in Irrigation	16	2	11	11
Advanced Certificate in Pastoral Zone Management	4	3	2	2
Total:	86	81	69	67
Total for the three colleges	353	360	307	282

No new courses were introduced during 1978-9. However, the current courses at Orange Agricultural College (i.e., the Associate Diploma in Farm Management and the Associate Diploma in Farm Secretarial Studies) were significantly changed in their structure. Effective from the commencement of the 1979 academic year, both courses were offered in a unitized form. That is, each semester's work is divided up into discrete units or subjects, with a system of pre-requisite and co-requisite requirements for progression. Each individual unit has been allocated a credit point value and graduation requires the accumulation of 100 credit points, which must include all compulsory core units plus a balance of optional or elective units.

Short-term Schools and courses

Course	Duration	Number attending	Sponsor
Orange Agricultural College—			
Veterinary Officers Conference	4 days	30	Veterinarians Association.
Farriering School	4 days	14	College.
Winchcombe Carson Conference	3 days	40	Winchcombe Carson Ltd.
Bankers Short Course	5 days	32	College.
Horse Reproduction School	2 days	12	College.
District Agronomist's Conference	4 days	45	Department of Agriculture.
Parents Week	3 days	70	College.
Farriers' Short Course	2 days	14	College.
Farm Office Short Course	2 days	22	College.
Winchcombe Carson Conference	3 days	60	Winchcombe Carson Ltd.
Agricultural Science Teachers' Conference	2 days	40	Department of Education.
University Geography Students	4 days	28	University of New South Wales.
Campdrafting School	2 days	80	Orange Pony Club,
Farriering Course	2 days	15	College.
Advanced Farriering Course	2 days	15	College.
Grain Elevators Board School	4 days	40	Grain Elevators Board of New South Wales.
Weeds Conference	5 days	30	Department of Agriculture.
Communications Workshop	6 days	45	University of New South Wales.
C. B. Alexander Agricultural College—			
Dairy Cattle Judging School	2 days	33	Australian Illawarra Shorthorn Society, and College.
Horse Course for Rural Youth	5 days	30	Regional Extension Service, Maitland, and College.
Refresher Course for ex-students	2 days	6	College.
Seminar on Women in Agriculture	1 day	50	New South Wales Business and Professional Women's Association.
Beef and Dairy Cattle Judging School	1 day	50	Agricultural Societies' Council, and College.
Basic Skills and Understanding for the Part-time Farmer	7 weeks (1 night per week)	70	Department of Community Programmes, University of Newcastle, and College.
Drug Education Symposium	1 day	25	Hunter Drug Advisory Service.
Summer School on Rural Life and Recreation	3 days	35	Department of Community Programmes, University of Newcastle, and College.
Advanced Professional Training Workshop	5 days	28	Department of Community Programmes, University of Newcastle.
Seminar for participants in Management course at International Training Institute, Sydney	1 day	28	College.
Music School	5 days	40	St Mary's Band Club.
Cattle Judging School	3 days	40	Angus Society of New South Wales, Regional Extension Staff, and College.
Psychotherapy Course	5 days	14	Department of Community Programmes, University of Newcastle.
Yanco Agricultural College—			
Irrigation Course	5 days	40	Orange Agricultural College.
Irrigation Course	5 days	32	Bank of New South Wales, and Rural Youth.
Farm Accounting for Farmers' wives	1 day (per week)	10	College.
Rural Youth	8 weeks	30	Rural Youth, and Bank of New South Wales.
Grain Elevators Board	3 days	30	Grain Elevators Board of New South Wales.
Meat Inspectors	2 days	30	Department of Agriculture.
Soil Science Conference	1 day	25	Soil Science Association.
High School Students (Link Programme, T.A.F.E.)	3 days	60	Department of Education, and T.A.F.E.
Tractor Operation	1 day	12	C.Y.S.S., Deniliquin.
Photography	2 days	30	Arts Council.
Dwarf Citrus Field Day	1 day	240	Department of Agriculture.
Pig Farming Course	1 day	30	Department of Agriculture.
Pig Farming Course	5 days	6	Pig Improvement Company.
Irrigation Course	1 day (per week)	20	Hawker College, Australian Capital Territory.
Basic Agriculture Course	6 weeks	60	Catholic Colleges, Sydney.
Rice Growing Course	2 days	8	New area rice farmers.
Irrigation	3 days	200	Irrigation equipment firms.

STAFF ESTABLISHMENT AS AT 30TH JUNE, 1979

Location	Professional				General and ministerial			Admin. and clerical ⁶	Total
	Res. ¹	Educ. ²	Admin. ³	Total	Res. ⁴	Other ⁵	Total		
Secretariat	1	..	..	1	1	..	1	2	4
Orange	..	18	1	19	..	37	37	9	65
C. B. Alexander	..	10	1	11	..	41	41	5	57
Yanco	..	11	1	12	..	52	52	5	69
	1	39	3	43	1	130	131	21	195

1 Professional officer whose time is predominantly occupied on research projects.

2 Professional officer whose time is predominantly occupied on education.

3 Professional officer whose time is predominantly occupied on administrative or other activities.

4 Clerical assistant whose time is predominantly occupied in assisting the research officer.

5 Other General Division and ministerial staff. Typists, office assistants and clerical assistants are included in these figures.

6 Only accounting machine operators, stenographers, male clerical positions and library officers are included in these figures.

NEW SOUTH WALES INSTITUTE OF RURAL STUDIES

On the recommendation of the Institute, on 14th February, 1979, the Minister for Agriculture approved the establishment of College Advisory Boards for Yanco and C. B. Alexander Agricultural Colleges. The Boards will report to the Minister, via the Director-General, on matters associated with the development of the Colleges, including a review of current and proposed resource use and requirements.

Detailed syllabuses are being prepared by Yanco and C. B. Alexander Agricultural Colleges for the voluntary apprenticeship scheme for dairy farmers in New South Wales. Cabinet approved of the appropriate legislation to allow the scheme to commence in 1979.

PART B—ADMINISTRATION

CENTRAL ADMINISTRATION

DEVELOPMENTS

Head Office Branches and Divisions of the Department moved into new office accommodation in McKell Building, Rawson Place, in March 1979.

The administration of the Royal Botanic Gardens, the Government Domain and Centennial Park was transferred to the Premier's Department, effective from 30th March, 1979, following a decision by the Premier in late 1978.

In common with other Departments, the Department had to reduce its staff establishment to meet new staffing levels set for the financial year ended 30th June, 1979. The establishment was reduced by 314 positions.

BRANCHES AND SECTIONS

Central Secretariat

The Secretariat provides secretarial and service assistance for the Minister and Executive, keeps central records and handles general correspondence.

Staff

This processes matters relating to salary and wages, allowances, transfers, promotions, resignations, and retirements, leave, industrial agreements and awards. It also maintains salary, leave and other staff records.

Personnel and Training

This is concerned with recruitment, induction, counselling, training and development of staff.

Accounts and Accounts Inspection

This receives and pays public moneys, keeps financial records, controls purchases and inspects accounts of branches and institutions.

Legal

This is responsible for the preparation of legislation, drafting of regulations, notifications and proclamations, conduct of prosecutions, preparation of legal documents (leases, bills of sale, building agreements) and legal advisings, and licensing of farm produce agents.

Management Services

This is responsible for office and ancillary accommodation, layout of offices, office housekeeping and facilities, including furniture and furnishings, telephones, telex, office machines and aids, forms design, systems analysis and design, organization and methods surveys.

Pesticide and Environmental Matters

There are two separate units. One is headed by the Registrar of Pesticides, who is responsible for the administration of the Pest Destroyers Act, 1945 (until repealed) and of the Pesticides Act, 1978, and allied matters. The second is headed by the Director of Pesticides and Environmental Studies, who is responsible for the review, development and co-ordination with other Divisions, Branches, Departments and Authorities of research and extension relating to pesticide residues and other environmental problems of concern to the department.

During the year the Director of Pesticides and Environmental Studies also assumed an administrative and advisory role in the Argentine Ant Eradication Campaign, which is jointly carried out with local government.

Overseas Aid

This administers the Department's involvement in overseas aid projects and training programmes sponsored by the Australian Development Assistance Bureau.

COMMITTEES, COUNCILS AND TRUSTS

Australian Agricultural Council

The Council, which comprises principally the Ministers for Primary Industry and Agriculture of the Commonwealth and the States, met on two occasions during the year at Sydney and Christchurch, New Zealand.

Some of the more important matters dealt with by Council at these ordinary meetings were Stage II of the dairy industry marketing arrangements; beef carcass classification and stabilization; biological control of Paterson's curse (Salvation Jane); wine grape surpluses, and brucellosis and tuberculosis finance.

Standing Committee on Agriculture

Meetings of the Standing Committee, which are attended by delegations from the respective Departments led by the Permanent Head, were held on three occasions during the year at Sydney (twice) and Christchurch, New Zealand. Of these, a special meeting was held in Sydney and the two ordinary meetings were held in conjunction with the scheduled meetings of the Australian Agricultural Council.

The main topics discussed were Stage II of the dairy industry marketing arrangements; beef carcass classification, covering the co-ordination of State activities (National Co-ordinator's Report), the supervisory committee's report and proposed legislation; blue tongue; and the report by the Industry Assistance Commission on wheat stabilization.

The special meeting held in Sydney was called to discuss a report of the Working Party on Wheat Stabilization and the report of the Working Party on Infestation in Grain.

Farrer Memorial Trust

An annual and two ordinary meetings of the Trust were held during the period under review.

Total funds held by the Trust at 31st December, 1978 amounted to \$52,624, comprising investments of \$47,420, cash at bank of \$2,968, accrued interest of \$1,783 and assets of \$453. Donations received during the year totalled \$953, to which must be added the sum of \$350 received from the Rural Bank of New South Wales (for assistance in staging the 1978 Farrer Memorial Oration), and \$600 donated by the New South Wales Flour Millers Council (as a direct subsidy to allowances paid to the 1976 Farrer scholar). The Auditor-General of New South Wales has certified that an examination of Trust accounts at 31st December, 1978 was satisfactory.

The 1978 Farrer Memorial Medal was awarded to Mr Walter Ives, C.B.E., former Secretary of the Department of Primary Industry, Canberra and now the Chairman of the Primary Industry Bank of Australia Limited. On this occasion Mr Ives was invited to deliver the 1978 Farrer Memorial Oration, which was entitled 'The Development of Agricultural Policy in the Australian Federation'. This event took place on 28th September 1978, in the Great Hall of the University of Sydney, and was organized by the Farrer Memorial Trust in conjunction with the New South Wales Branch of the Australian Institute of Agricultural Science. Mr Ives was honoured by the presence of many distinguished guests, of whom a good number travelled from Canberra to celebrate this occasion with him.

The 1976 Farrer Memorial Research Scholar, Mr S.N. Spear, concluded the term of his scholarship leading towards the award of a Ph.D. degree.

The 1979 Farrer Memorial Research Scholarship was awarded to Mr R.G. Flood, a scientific officer of the Department of Agriculture, Victoria. Mr Flood has commenced post-graduate studies whilst on leave from his employer, at the University of Melbourne. The project which Mr Flood is pursuing is entitled "A Study of the Genetic Control of Developmental Responses in *Triticum aestivum* (wheat)".

Royal Botanic Gardens and Government Domain Trust

Action was initiated by the Premier of New South Wales to transfer to the Premier's Department the responsibility for the administration of the Royal Botanic Gardens, Government Domain and allied areas. Following lengthy negotiations between the Secretary of the Trust and the Department of Agriculture with the Premier's Department, administrative and financial control passed from the Department of Agriculture to the Premier's Department on 30th March, 1979.

Prior to the transfer taking place, five meetings of the Trust were held during the year under review. Some of the more important matters included: construction of a new kiosk building in the Gardens, following the destruction by fire of the old building in 1977; a visit of the trustees to the

Mt Tomah Annex, to inspect the progressive establishment of this cool climate annex of the Royal Botanic Gardens; the Trust's co-operation with the Sydney Committee in the staging of the 1978 Festival of Sydney; a scheme to install improved lighting throughout the Government Domain, which was approved and commenced; the calling of tenders for the lease of the new kiosk building; and the continuing negotiations with the lessees of the Government Domain kiosk ("Pavilion in the Park" towards the approval of a new lease.

SERVICES TO OTHER DEPARTMENTS AND ORGANIZATIONS

The Department provides a wide range of services to other Departments and organizations. The following are examples of the services provided:

- Economists undertook research for the Cabinet Sub-Committee on Management Audits, the Forestry Commission, the Planning and Environment Commission and the Homebush Abattoir Corporation.
- Wheat testing was carried out for Sydney University, the University of New England and the De Kalb Shand Seed Co.
- Visits were arranged to various research centres and stations for four agricultural and trade delegations from the Peoples Republic of China.
- Veterinary assistance was provided for livestock on properties administered by the Departments of Education, Corrective Services, Police, Youth and Community Services, the Health Commission, CSIRO and the National Parks and Wildlife Service.
- Assistance and advice were given to the Water Resources Commission on allocations for loans under the Farm Water Supply Act for irrigation installations.
- Advice was given to the Industries Assistance Commission on developments and problems in the citrus, pome fruit and grape industries.
- In co-operation with the Department of Technical and Further Education, a dairy farming apprenticeship scheme was established to enable young farm workers to continue their education after leaving school.
- For the Mines Department, 154 properties were inspected (in respect of forty-four applications to enter under the Mining Act) to assess land classification where applications to prospect or mine were contested by landholders.
- Botanical advisory services were provided to the National Parks and Wildlife Service, Soil Conservation Service, Forestry Commission, Police Department, Customs and Excise Bureau, State Fisheries Branch, Water Resources Commission, and various other authorities and local councils.
- Further assistance was given to the Australian Development Assistance Bureau in the conduct of feasibility studies for the provision of consulting services in Sri Lanka, Bangladesh, Pakistan, Thailand and Indonesia, and the conduct of projects in Sri Lanka and Bangladesh.
- Advice and recommendations have been given to other Departments and Authorities in relation to environmental impact studies, and particularly to local government, concerning proposed urban and commercial developments which may have adverse environmental effects on adjacent viable agricultural land.

Other advice and assistance provided included—

- The provision of work experience for local high school and technical college students.
- The use of agricultural college facilities by various local groups for cultural, sporting and educational activities.
- Investigations, with the Department of Youth and Community Services, in connection with 159 applications for flood relief and bushfire relief.
- The administration of noxious plant control, with the Department of Local Government and councils.
- Advice given to the Department of Local Government, shire and municipal councils on the Argentine Ant Eradication Campaign.
- Advice given to various authorities in connection with the Australian plague locust.
- Advice given to grain authorities and CSIRO on insects in grain.
- Assistance given to various authorities on plant diseases and the identification of plant parasitic and other fungi.
- Advice given to a number of State and Commonwealth Departments on statistics and computing.

OVERSEAS CONFERENCES AND STUDY TOURS

Name and designation	Country visited	Purpose
Dr R. B. Dun <i>Deputy Director-General</i>	Indonesia, Philippines ..	As a member of a task force of the consultative committee on research and development, reporting to the Australian Development Assistance Bureau on new initiatives in the aid programme in South East Asia.
Dr K. P. Sheridan <i>Assistant Director-General</i>	China	Member of New South Wales Government Mission.
Dr D. J. McDonald <i>Regional Director of Research, Yanco</i>	Burma	To continue involvement in the United Nations World Bank Seed Development Project.
Dr P. A. McInnes <i>Regional Director of Research, Orange</i>	China	Member of Australian Delegation to the Agricultural Machinery Exhibition, Peking
Dr P. A. McInnes <i>Regional Director of Research, Orange</i>	India	Member of Australian Delegation in pursuance of the Science/Technology Agreement between Australia and the Republic of India.
Dr P. A. McInnes <i>Regional Director of Research, Orange</i>	China	To advise on feasibility of Australian Agriculturists assisting in development of a State Farm in the Hunan Province. Inspect poultry and pig units in that Province.
Dr P. J. Mylrea <i>Director of Veterinary Research</i>	Bangladesh	To assist with Departmental aid programme.
G. J. Skillman <i>Principal Veterinary Officer (Quarantine)</i>	Indonesia	Short-term aid assignment, lecturing and visiting quarantine facilities.
Dr G. E. Robards <i>Special Livestock Research Officer</i>	U.K.	Study tour of animal and plant research laboratories.
Dr R. A. E. Pym <i>Senior Livestock Research Officer</i>	Indonesia	Lecturing to training course in poultry production.
Dr R. A. E. Pym <i>Senior Livestock Research Officer</i>	U.S.A., U.K.	Study tour on poultry genetics.
Dr E. S. Batterham <i>Senior Research Scientist</i>	U.K., Denmark, West Germany, France.	Study tour of pig research units.
P. T. Gilchrist <i>Special Veterinary Officer (Poultry Health)</i>	Indonesia	To report on disease control in the Centre for Animal Husbandry Research and Development.
J. G. Boulton <i>Veterinary Research Officer</i>	Canada	Post-graduate training.
Dr A. R. Jackson <i>Special Veterinary Research Officer</i>	Malaysia	To lecture under the Australian/Asian Universities Co-operation Scheme.
A. G. Kaiser <i>Livestock Research Officer</i>	U.K.	Study leave at the Grassland Research Institute, Hurley.
N. M. Fogarty <i>Senior Livestock Research Officer</i>	U.S.A.	Study leave at University of Nebraska, Lincoln and United States Meat Animal Research Centre, Clay Centre.
R. Barlow <i>Special Livestock Research Officer</i>	Eire	Study leave at Agricultural Research Institute, Castleknock.
J. W. Turpin <i>Principal Horticulturist (Regulatory)</i>	Singapore, South-east Asia	Seconded to Commonwealth Department of Primary Industry to report outturns of Australian fresh fruit and vegetables.
K. J. Scott <i>Senior Research Scientist</i>	New Zealand	Collaborative research on commercial post-harvest treatment of export apples.
J. F. Johnson <i>Principal Horticulturist (Pome Fruits)</i>	New Zealand	Developments in pome fruit industry.
D. K. O'Toole <i>Dairy Officer (Research)</i>	New Zealand	To study Dairy Product Quality Assurance Methods.
R. J. Thompson <i>Livestock Officer (Dairy Cattle)</i>	U.S.A.	To study Pollution Control and Waste Management from Intensive Animal Production Units.
E. J. Knights <i>Research Agronomist</i>	India	To attend International Chickpea Improvement Workshop.
I. A. Rose <i>Research Agronomist</i>	U.S.A.	To attend World Soybean Research Conference and Plant Breeding Symposium.
J. M. Morgan <i>Research Agronomist</i>	U.S.A.	To attend workshop on Adaptation to Water and High Temperature Stress.
K. W. Dawbin <i>Remote Sensing Officer</i>	U.S.A., Mexico	To attend Large Area Crop Inventory Symposium. Visit IBM Computing Centre, Mexico City.
J. A. Armstrong <i>Botanist</i>	New Zealand	To attend, and present keynote address, International Symposium on Reproduction in Flowering Plants.
J. Kuiper <i>Special Plant Pathologist</i>	Germany, other European countries, U.K.	To attend 3rd International Congress on Plant Pathology, Munich. Study research developments on cereal diseases.
Dr D. G. Herridge <i>Senior Bacteriologist</i>	China	To study agricultural application of biological nitrogen fixation.
Dr F. R. Higginson <i>Director of Chemistry</i>	U.S.A.	To study new techniques and automation of soil and plant tissue testing.
Dr B. V. McCleary <i>Research Scientist</i>	U.S.A., Canada	Post-doctoral research in carbohydrate biochemistry and attend meeting of International Union of Biochemists.
R. G. Weir <i>Special Chemist</i>	New Zealand	To attend 8th International Colloquium on Plant Analysis and Fertilizer Problems.

Name and Designation	Country Visited	Purpose
P. J. Milham <i>Senior Chemist</i>	New Zealand	To attend 8th International Colloquium on Plant Analysis and Fertilizer Problems.
W. C. Barnes <i>Senior Chemist</i>	Canada, U.S.A.	To attend 6th International Cereal and Bread Congress, and study new techniques in cereal chemistry.
A. B. Blakeney <i>Senior Chemist</i>	Canada, U.S.A. Philip-pines.	To attend 6th International Cereal and Bread Congress, and study new techniques in rice chemistry.
A. S. Awad <i>Senior Chemist</i>	Israel, Egypt, Gulf States	To study new developments in hydroponics, and utilization of saline waters for agriculture.
G. D. Batten <i>Chemist</i>	U.S.A., U.K., Denmark, Sweden.	To study laboratory and field techniques used to evaluate wheat varieties for low phosphorus requirement.
I. G. Ferris <i>Chemist</i>	U.S.A.	Post-graduate studies in pesticide biochemistry.
G. J. Osborne <i>Senior Chemist</i>	U.K.	Post-graduate studies in soil science.
M. Casimir <i>Director of Entomology</i>	China	To study pest control methods.
E. Schicha <i>Special Entomologist</i>	New Caledonia	To study predatory mites.
W. A. Palmer <i>Senior Entomologist</i>	U.S.A.	Post-graduate studies on stock parasites.
H. G. Greening <i>Senior Entomologist</i>	U.S.S.R.	To attend symposium on grain protection.
D. Fardy <i>Extension Research Officer</i>	Thailand	To advise Thailand Department of Agriculture on monitoring and evaluating an extension service.

STAFF STATISTICS

Departmental staff establishment as at 30th June, 1979*

	Professional					General and ministerial			Clerical ⁷	Total
	Res. ¹	Ext. ²	Educ. ³	Admin. ⁴	Total	Reg. ⁵	Other ⁶	Total		
Central Admin. ..	2	..	..	18	20	10	8	18	144	182
Ext. Services ..	3	40	..	15	58	..	47	47	123	228
Animal Industry ..	73	131	..	29	233	1 297	93	1 390	166	1 789
Dairying ..	9	33	..	13	55	..	47	47	17	119
Horticulture ..	29	34	..	16	79	135	7	142	25	246
Plant Industry ..	79	61	..	18	158	22	13	35	16	209
B. & C.R.I. ..	94	..	..	7	101	..	89	89	19	209
Biometrical ..	13	..	..	2	15	..	..	..	4	19
Mktg. & Ec ..	29	..	..	9	38	..	13	13	14	65
Res. Services ..	8	9	..	32	49	..	498	498	70	617
Ag. Education ..	3	..	40	4	47	..	117	117	28	192
	342	308	40	163	853	1 464	1 371	2 396	626	3 875

* Trainees and prickly-pear casual staff are not included.

1 Professional officers whose time is predominantly occupied on research projects and laboratory diagnostic services.

2 Professional officers whose time is predominantly occupied on extension to farmers.

3 Professional officers whose time is predominantly occupied on agricultural education.

4 Professional officers whose time is predominantly occupied on administrative or other activities.

5 General Division and Ministerial staff whose time is predominantly occupied on regulatory activities.

6 Other General Division and Ministerial staff (not including typists and clerical assistants).

7 Clerical (including clerks, typists, Stenographers, Machine operators and clerical assistants).

SENIOR RETIREMENTS, RESIGNATIONS AND APPOINTMENTS

Retirements

T. H. Johns	Director, Pesticides and Environmental Studies
B. A. Chadwick	Senior Architect
D. G. Christie	Deputy Chief, Division of Animal Industry
R. C. Denyer	Principal Veterinary Officer
E. J. McBarron	Principal Veterinary Research Officer
E. C. Connor	Principal Horticulturist (Extension)
F. W. Cradock	Assistant Director of Chemistry
R. W. Shelley	Regional Director of Extension, Goulburn

Resignations

J. N. Potter	Chief, Division of Extension Services
Dr N. J. Campbell	Special Veterinary Research Officer

Deaths

The death occurred on 29th May, 1979 of Dr Joyce W. Vickery, D.Sc., M.B.E., who joined the staff of the National Herbarium in 1936, held the position of Botanist, Special Botanist, and Senior Botanist (when that position was approximately equivalent to that of Assistant Director of the National Herbarium). After her retirement in 1973, Dr Vickery continued in research at the National Herbarium as an Honorary Research Fellow.

Appointments

L. R. Greenup	Director, Pesticides and Environmental Studies
C. Gellatly	Principal Economist, Division of Marketing and Economics
R. J. Jessup	Executive Assistant
R. A. Claxton	Deputy Chief, Division of Extension Services
R. Mackay	Senior Architect
D. A. Dickinson	Deputy Chief, Division of Animal Industry
F. W. Evans	Chairman, Board of Tick Control
B. W. Bootes	Director, Animal Disease Control
J. Keogh	Director, Brucellosis Eradication
I. R. Littlejohns	Deputy Director of Veterinary Research
J. H. Duncan	Principal Horticulturist (Extension)
J. B. Forsyth	Principal Horticulturist (Citrus)
Dr K. J. Moore	Acting Director of Biology
Dr D. R. Leece	Assistant Director of Chemistry
F. S. Benecke	Chief, Division of Extension Services
R. S. Sproule	Regional Director of Extension, Goulburn
R. E. Jones	Secretary
W. G. Bryant	Assistant Secretary (Administration)
D. A. Smith	Assistant Secretary (Finance)

Transfers/Secondments

B. J. Standen, Principal Economist—seconded to Australian Meat and Livestock Corporation.
F. H. Drane, Principal Economist—to Sri Lanka as Director on an Australian Aid Project.
A. R. Gleeson, Director of Animal Production Research seconded to Overseas Trade Authority, Premier's Department.

MARKETING BOARDS AND POLLS

The Division of Marketing and Economics is responsible for the administration of the Marketing of Primary Products Act, 1927, and, in particular, for the appointment of members of the Boards established under the Act.

The twelve Marketing Boards in operation during the year were the Barley, Central Coast (N.S.W.) Citrus, Egg, Grain Sorghum, Lemon, Murray Valley (N.S.W.) Citrus, Oats, Oilseeds, Rice, Tobacco Leaf, Wine Grapes and Yellow Maize Marketing Boards. The Sheep Meats Marketing Board remained in recess.

Polls under the Marketing of Primary Products Act

By arrangement, and with the approval of the Minister for Agriculture, the State Electoral Office has, since late 1977, conducted all the triennial elections of representatives of producers to these Marketing Boards, with the Electoral Commissioner for New South Wales being the Returning Officer. The Division of Marketing and Economics has been the link between the Minister, the Electoral Office and the Boards. In all cases, the Division carried out most of the preparatory work involved in the holding of these polls.

Four polls were conducted under the Act by the Electoral Office in conjunction with the Division during 1978-9. These were—

- (1) Triennial election of three producers' representatives to the Yellow Maize Marketing Board (6th February, 1979). The three sitting members were the only candidates and they were declared elected unopposed for a new three-year term of office from 19th March, 1979.
- (2) Triennial election of three producers' representatives to the Murray Valley (N.S.W.) Citrus Marketing Board (27th March, 1979). The three sitting members were the only candidates and they were declared elected unopposed for a new three-year term of office from 5th May, 1979.

- (3) Triennial election of five producers' representatives to the Oilseeds Marketing Board (10th April, 1979). Only five persons were nominated, including four of the existing Board, and they were declared elected unopposed for a new three-year term of office from 11th May, 1979.
- (4) Triennial election of five producers' representatives to the Central Coast (N.S.W.) Citrus Marketing Board (31st July, 1979). When nominations closed in June, only five candidates had been nominated and they were declared elected unopposed for a new three-year term from 15th September, 1979.

During the year the Division had also carried out the work needed to hold a by-election on 4th December, 1978, to fill a vacancy on the Oilseeds Marketing Board. An industrial dispute at the Government Printing Office affected the programme and it was necessary to cancel the by-election. The vacant position was filled at the triennial election held in early 1979.

Prior to the end of June, 1979, the Division prepared electoral programmes and undertook preliminary work connected with the triennial elections of producers' representatives to the Rice Marketing Board and Egg Marketing Board. The polls are to be conducted by the State Electoral Office and are scheduled to close on 25th September (Rice) and 2nd October (Eggs).

The Division also assisted the State Electoral Office in conducting a poll to elect four producers' representatives to the Dried Fruits Board of New South Wales. It also conducted a poll for the election of six State Councillors to the Potato Growers' Association of New South Wales.

DIVISIONAL ADMINISTRATION

DIVISION OF ANIMAL INDUSTRY

Functions

The Division is responsible for research, extension and regulatory control of livestock production and health.

Research is conducted into diseases of all classes of commercial livestock and the breeding, nutrition and management of sheep, beef cattle, pigs, poultry, Angora goats and bees, together with nutrition of dairy cattle. Noxious and feral animal research is also undertaken.

Extension is directed at educating stockowners to improve the efficiency of selection, reproduction, management and nutrition of sheep, beef cattle, pigs, poultry, Angora goats and bees, including the prevention and control of disease in these species and in dairy cattle.

Regulatory control is exercised over scheduled diseases and pests of livestock and bees, the identification of livestock and the control of noxious animals and insects. The Division is responsible for inspection of meat for local consumption; administration of certain Government drought, bushfire and flood relief schemes; maintenance and improvement of public watering places in the Western Division; and the registration of stock foods and medicines. On behalf of the Australian Government, the Division administers the sections of the Quarantine Act relating to the import and export of animals and the import of animal products.

Significant Administrative Developments

The Public Service Board has approved of the Division of Animal Industry being re-formed into two—the Divisions of Animal Health and Animal Production, effective from 1st July, 1979.

DIVISION OF PLANT INDUSTRY

Functions

The functions of the Division of Plant Industry are mainly in the broad fields of agronomic research and extension. The Division also administers the Agricultural Seeds Act, for which it has a small regulatory staff and a Seeds Laboratory.

The Division is responsible for research and extension within the whole range of field crops and pastures, fodder conservation, seed production, weed control, irrigation, and remote sensing. Its research covers breeding, physiology, ecology and nutrition of crops and pastures, and the ecology of weeds. It covers the development of new crops and of new practices such as reduced tillage.

The Prickly-pear Destruction Commission, which functions within the administration of the Division, presents a separate report to Parliament. (See Annexe page 105.)

DIVISION OF HORTICULTURE

Functions

The functions of the Division of Horticulture are concerned with the prevention and control of plant pests and diseases, and the production, marketing and export of fruit and vegetables. Research, extension and regulatory services are largely designed to assist those industries involved in the growing, post-harvest handling and processing of fruit and vegetables crops. However, in respect to the

administration of plant quarantine, the full range of agricultural pests and diseases are covered; with inspections and certification of exports, the Division's responsibilities embrace commodities such as grain as well as horticultural products.

Research—Research horticulturists are located at research stations and laboratories on the north coast, central coast, northern tablelands, central tablelands and in the County of Cumberland as well as in the central west, Murrumbidgee and Lower Murray irrigation areas. A comprehensive research programme relating to plant improvement, establishment/management, production/harvesting, storage/disinfestation, product quality and economics is being conducted with respect to fruit, vegetables and, to lesser degree, ornamental crops.

Extension—Extension horticulturists are located in the major fruit and vegetable production areas of the State, with the object of assisting primary producers to obtain maximum benefit from their resources by adopting improved techniques. Extension horticulturists are the link between research and commercial practices. They also assist in the prevention and control of plant pests and diseases, as well as being responsible for the presentation of statistical information and crop forecasts.

Regulatory—Inspectors (Plant Diseases Act) enforce legislation concerned with the prevention and control of plant pests and diseases; the grading, packaging and labelling of fresh fruits/vegetables; the licensing of potato growers, nurserymen and resellers of nursery stock; and maintaining fruit/vegetable quality standards. As agents for the Commonwealth Government, the Export and Import Branch of this Division administers the plant quarantine provisions of the Quarantine Act, and regulations relating to the export of fresh fruit, vegetables, plants, seeds, flour, wheat and other grains under the Commerce (Trade Descriptions) Act.

Significant Administrative Developments

The duties of the Assistant Principal Horticulturist (Extension) were reviewed by including responsibility for nurseries and nut crops. The initiative was in response to a strong demand from commercial growers for an extension service in floriculture and the growing interest in the development of nut crops.

The Citrus Demonstration Orchard at Cudgel in the Murrumbidgee Irrigation Area, which was acquired by the Department of Agriculture in September, 1969, and developed as a citrus orchard with assistance from C.E.S.G., was disposed of in June, 1978. The orchard was developed to a stage when the objectives of the demonstration had been achieved. Publications on the successful use of irrigation and the sound management practices employed to establish the orchard on sandhill areas are in press.

DIVISION OF DAIRYING

Functions

The Division performs three functions: extension, regulatory and research. It has responsibility for assisting the industry in all phases of farm production and product manufacture to the point of marketing.

Extension—Guiding farmers and manufacturers in—

- Animal husbandry techniques.
- Stock quality and production, through its herd production improvement programme.
- Milking shed management and machine efficiency.
- Farm business management.
- Production of high-quality milk, cream and manufactured dairy products.

Regulatory—The Division has responsibility for administering the Dairy Industry Act and certain provisions of the New South Wales Pure Food Act, under which powers are exercised to:

- Safeguard farmers in regard to payment for their milk and cream.
- Enforce prescribed product standards.
- Ensure satisfactory standards of hygiene at farm and factory.
- Examine factory personnel and milk tanker operation for competency, and issue certificates.
- Register dairy product factories and stores.
- Check grade and test milk and cream.

Research—The Division also undertakes research on dairy foods, sanitizers, milking machines, milking management, mastitis control, herd improvement, nutrition and genetics.

Significant Administrative Developments

As a result of a reorganization of the Department, the Division of Dairying ceases operations as a separate entity on 30th June, 1979. As from 1st July, 1979, the functions previously undertaken by the Division of Dairying will become a part of the newly created Division of Animal Production.

A computerized dairy farm performance data analysis scheme was introduced to allow effective farm management extension to be offered to a wide cross-section of dairy farmers.

A somatic cell counting scheme was introduced to assess mastitis incidence in herds and individual cows.

A bulk milk cell count competition was held to encourage dairymen to reduce somatic cell count levels.

Video cassette training films were prepared for use in extension to farmers and factory operatives.

Administrative changes in the Dairy Herd Improvement Programme were implemented in order to contain rising costs.

DIVISION OF RESEARCH SERVICES

Functions

The major function of the Division of Research Services is to provide the structural framework within which the Department's regional research is conducted. It is responsible for research administration, research co-ordination, the operation and management of the regional research institutions, agricultural engineering services and architectural services.

Research Administration and Co-ordination

The functions of the Chief of the Division, the regional directors of research, directors of research and the Research Co-ordinator involve not only the administration of the Division, but also many aspects of the Department's research services outside the Division. These functions integrate with those of the Assistant Director-General and all Divisional or discipline-oriented research directors. This involves—

- Research co-ordination across the Divisions by the Chief and the Research Co-ordinator, including administration of industry research grants and liaison with other research organizations.
- Research co-ordination across the Divisions and regional research programme development by the five regional directors of research, with headquarters at Wollongbar, Tamworth, Orange, Wagga and Yanco.
- The conducting of regional research programmes by the regional directors of research, the Director of Research, Trangie, as well as three research supervisors at Grafton, Glen Innes and Condobolin. Although not officers of the Division, these supervisors assist formally in the direction of research programmes at District level.

Research Centres and Station Management

Closely associated with the research administration functions are the management positions of Principal Officer (Management) and twenty station managers. These officers provide and manage the physical resources on the properties under their control. Their functions include: planning of property management programmes; organizing and managing the duplication of resources; maintaining and developing the Department's properties and ensuring the safety of its assets; controlling expenditure.

Administrative management support is provided by the Administrative Officer and senior clerks at each of the five research headquarters and in Head Office, and by clerical officers at individual stations. These provide assistance to managers in: staff recruitment and selection; accounting procedures and financial management; supervision and training of office staff.

Agricultural Engineering

The Division is responsible for providing and managing Departmental agricultural engineering services in New South Wales. Agricultural engineering research and development is under the direction of the Senior Agricultural Engineer and is carried out by engineers at the Agricultural Engineering Centre, Glenfield, and the Agricultural Research Station, Condobolin.

Farm mechanization extension is provided by eight agricultural mechanization officers located in extension regions under the direction of the Senior Agricultural Mechanization Officer.

Technical officers located in the head office are responsible for advice on and oversight of purchases of major items of plant and equipment, including laboratory equipment; and the purchase, registration, insurance and disposal of all Departmental motor vehicles. One officer is actively engaged in the design, specification, tendering and supervision of the installation of electrical and mechanical services in glasshouses and laboratory installations for use by the Department.

Architectural Services

The Architect Section designs, supervises and advises on the construction and maintenance of buildings and building services on Departmental properties. Its members are actively engaged, in conjunction with the Deputy Chief of the Division, in the implementation of the building component of the Department's Capital Works Programme and in the maintenance and repair of its buildings. The Architect also co-ordinates work being undertaken for this Department by the Department of Public Works and the Housing Commission. An advisory service is available to primary producers on the construction of standard farm structures.

Significant Administrative Developments

Senior clerks' positions at the five agricultural research centres at Wagga, Tamworth, Orange, Wollongbar and Yanco were upgraded to Grade 2/3. These officers, in addition to providing advice and assistance in all areas of accounting, staffing and clerical procedures at their centres, now have responsibility for the oversight of clerical and administrative procedures at research station units within their respective research directorates. The filling of the newly created position of Administrative Officer in Head Office has further strengthened the administrative support available within the Division.

The Director-General of Agriculture, under Public Service Regulation 220 (a), has become the sole authority for the purchase and disposal of livestock by all State Government departments, the agistment of livestock on all lands under the control of any department, and the agistment of Government-owned livestock on privately controlled land. Approvals for these actions are granted through the Division of Research Services.

In line with the Division's policy on decentralization, two positions of Agricultural Engineer were transferred to the Agricultural Research Station, Condobolin, to undertake research into equipment and power requirements related to crop production.

Authority was delegated by the Department to regional directors of research in the areas of renovation and tenancy of Departmental cottages; employment of casual labour at research centres and stations; promotion of farm assistants to Class 2 and assistants to Grade 1; the temporary relocation of Divisional staff within their directorates and the transfer of livestock, fodder, plant and equipment within their directorates.

During the year the position of Assistant Research Co-ordinator, one Architect and sixty-four other positions were deleted from the establishment of the Division to meet the requirements of staff establishment limits.

DIVISION OF EXTENSION SERVICES

Functions

- Directs and co-ordinates the Department's extension services throughout the State's eight agricultural regions.
- Administers and maintains the Department's regional offices.
- Supports staff with extension methods training and the provision of audio visual aids.
- Administers the Department's two certificate colleges and services the Institute of Rural Studies.
- Provides the publications and information services of the Department. These include editorial services, home gardens inquiries and press liaison.
- Promotes group extension activities and provides organizational help to the Agricultural Bureau of New South Wales.
- Conducts extension/research evaluation.
- Initiates extension/research liaison.
- Administers and provides professional staff for the Rural Youth Organization.
- Administers the Department's library services.

Significant Administrative Developments

Responsibility for administering the Agricultural Education Secretariat and the certificate colleges (Yanco Agricultural College and C. B. Alexander Agricultural College) was transferred from the Executive to the Division of Extension Services.

DIVISION OF MARKETING AND ECONOMICS

Functions

The Division of Marketing and Economics does research on all aspects of the production, marketing and handling of agricultural products, including development of research and extension methodology in agricultural economics and farm business management; provides advice on commodity prospects, marketing schemes and rural policy generally; and, working mainly through other Divisions, provides extension services in agricultural economics and farm business management. The Division also provides specialized liaison and in-service training in agricultural economics and farm business management to both Departmental research and extension officers.

The Division publishes a journal, the *Review of Marketing and Agricultural Economics*; a monthly *Commodity Bulletin*; and a bulletin series which, under the general title of *Miscellaneous Bulletin*, reports a variety of research studies, survey results and data collections. A number of regional economists publish local bulletin series to provide farmers and others with farm management and agricultural economics data.

A complete price reporting service is provided for all produce markets in the Sydney Metropolitan Area, and a retail price reporting service operates for meat, fruit and vegetables, and certain other commodities. Crop forecasts and market outlook and commodity information for a number of products are distributed to the media, producers, processors and other government authorities.

The Division also administers the Marketing of Primary Products Act, 1927, under which a number of primary produce marketing boards are constituted.

Officers of the Division are representatives on a number of State and Commonwealth boards and committees. Under the terms of the Dairy Industry Authority Act, the Division conducts cost-income surveys of all aspects of the dairy industry in New South Wales. Submissions on Rural Industry matters are prepared and presented to the Industries Assistance Commission.

Significant Administrative Developments

A review of the Marketing of Primary Products Act, 1927, continued and proposed changes have been circulated to interested persons for comment. It is proposed that a draft Bill will be prepared and presented to Parliament in the forthcoming year. In May, a two-day workshop was held with invited representation from universities, other Departments of Agriculture and other government departments to discuss factors relating to marketing boards.

The Livestock Market Reporting Service of the Division was significantly expanded with the appointment of four more officers. Officers now cover livestock sales at Homebush, Wagga, Dubbo, Tamworth, Gunnedah, Lismore and Casino.

To assist in the quicker dissemination of information from the Division's market reporting centres, three facsimile units have been acquired and it is expected that more units will be acquired to speed up this dissemination process.

BIOLOGICAL AND CHEMICAL RESEARCH INSTITUTE

Functions

Biology Branch—This consists of plant pathologists and legume bacteriologists.

Plant pathologists carry out research on diseases of plants, diagnose plant diseases and advise officers of other Divisions and primary producers on plant disease control. They advise State and Commonwealth authorities on matters relating to plant quarantine. The Electron Microscope Unit, concerned with virus and mycoplasma diseases of plants, also acts as a service unit to other Branches and Divisions of the Department.

Legume bacteriologists carry out research on factors influencing the successful establishment of nodule-producing bacteria in the soil and on the plant. They distribute cultures of those bacteria to other research centres and industrial organizations. They advise field officers of the Department and primary producers on the most efficient methods of legume inoculation. The Australian Inoculant Research and Control Service operates a quality-control service for commercial legume inoculants available throughout Australia to ensure the maintenance of high nitrogen-fixing ability.

Chemistry Branch—This is responsible for conducting research, providing analytical services and giving technical advice on chemical aspects of plant and animal production and related industries in New South Wales. The Branch is organized into five Sections: analytical chemistry; plant and cereal chemistry; pesticide chemistry; soil fertility and plant nutrition; and soil morphology and land use assessment.

Each of these specialist groups conducts research into problems facing agriculture in New South Wales and, at the same time, provides recommendations and analytical information to the Department's Extension Officers who advise farmers on their day-to-day problems. Some of these sections have the added responsibility of seeing that products such as pesticides, stockfeeds and medicines, fertilizers and cereals are of proper standard and are safe for both the farmer and the consumer.

Entomology Branch—This carries out research to improve pest control methods, particularly in relation to plant protection. Research programmes on insecticide resistance in the Australian sheep blowfly and the biological control of prickly-pear cacti are also included in the Branch's portfolio. In addition, the Branch identifies insects and mites submitted by extension officers, primary producers and the general public, and provides pest control recommendations. Expert technical advice is provided as part of the Department's regulatory function on various matters, including insecticide registration, quarantine, locust and fruit fly control, fresh fruit disinfestation and disinfestation of export grain.

Significant Administrative Developments

Biology Branch—This was re-organized in July, 1978, to match staff resources more efficiently, with revised priorities based on disciplines. The establishment of a Plant Disease Advisory Service, manned by four plant pathologists and two support staff, has streamlined diagnostic and extension services. One pathologist has been diverted from studies on berry fruits and grapes to a study of plant virology, with emphasis on insect-transmitted diseases. The Crop Loss Assessment Programme has been strengthened by the redeployment of a pathologist to Tamworth. The Bean Breeding Programme at Rydalmere has terminated, and a pathologist has been transferred to Wagga to study host/parasite relationships of *Septoria* diseases of wheat. Half of one pathologist's time has been diverted from mushroom work to epidemiological studies on bunch rot of grapes.

Extensions were made to the Electron Microscope Unit to house a Scanning Electron Microscope and ancillary equipment, and also to provide enlarged photographic and darkroom facilities in the Unit. The new equipment became operational in October, 1978.

Two controlled-environment growth rooms, for use in the Institute's research programme on culture and diseases and pest control in cultivated mushrooms, were completed during the year.

Chemistry Branch—This was re-organized, the existing seven sections being reduced to five to streamline administration and facilitate better communication and co-operation among staff working in similar disciplines.

The Plant and Soil Analytical Section was redesignated Analytical Section and given responsibility for inorganic analysis of soils, plants, fertilizers and waters, for analysis of stockfeeds and medicines, and for methods development. This brings the inorganic and organic (less pesticides) analytical services provided by the Branch under the one group.

A Soil Fertility and Plant Nutrition Section was formed from members of the former Soils, Plant Nutrition and Waters Sections. The purpose is to improve communication and co-operation among the members, and should lead to integrated advice being given on soil fertility and plant nutrition problems.

A Soil Morphology and Land Use Assessment Section, comprising soil physicists and soil surveyors, was formed to emphasize the expanded role of the former Soil Survey Unit in the field of land use assessment.

A Plant and Cereal Chemistry Section was formed by combining the former Cereal and Phytochemistry Sections. Both former Sections are now engaged in biochemical research, and this brings all biochemists into the one group, facilitating the sharing of equipment and ideas.

The Pesticide Chemistry Section remained unchanged, pending assessment of the impact of the Pesticides Act, 1978, on the work of the Section. It is possible that the new Analytical Chemistry Section will be too large. If the impact of the Pesticides Act is sufficiently small, then the role of the Pesticides Section might be expanded in the future to include all organic analytical chemistry.

The fifteen chemists located at regional research centres have also been brought within the new sectional organization to facilitate technical supervision, guidance and co-operation. An analytical chemist has been transferred from Wollongbar to Trangie, to provide analytical expertise in the Central West. Soil physicists have been appointed to Trangie and Narrabri to undertake land use research in the Macquarie, Namoi and Gwydir valleys.

Entomology Branch—Mr J. Hosking, Entomologist, was appointed to carry out research on the biological control of prickly-pear cacti and was located at the Agricultural Research Centre, Tamworth. This was a significant departure from the main stream of Entomology Branch research, which has always been directed at controlling insect pests as opposed to using insects as biological control agents for weeds. The appointment was made following representations from the Prickly-Pear Destruction Commission for research into biological control of noxious cacti due to the escalating costs of chemical control.

Miss R. Gunning, Entomologist, was appointed to replace Mr L. R. Greenup, following his appointment to the position of Director of Pesticide and Environmental Studies, and she is also located at Tamworth. Miss Gunning will continue some of Mr Greenup's research programmes, but with a new project on the control of sorghum midge.

The facilities in the new \$300,000 insecticide resistance bioassay unit were used for the first time to carry out essential investigations on insecticide resistance in spotted alfalfa aphid. Control failure occurred in the field during March and the resistance was characterized and quantified within six weeks. This would not have been possible without the facilities in the new laboratory.

Administration Branch—A new central, general store commissioned in October, 1978 has greatly contributed to the efficient and economic management of the three scientific branches. Modification of the main laboratory building has improved accommodation and permitted centralization of branch administration staff.

BIOMETRICAL BRANCH

Functions

The Biometrical Branch is responsible for the statistical and mathematical aspects of the Department's research activities. The staff of the Branch consult with research staff at all research stations, advise on proposed plans and methods of analysis and critically examine research projects. They also give seminars and training courses on advances in biometry and computing, and carry out biometrical research.

Consultation between biometrician and research worker leads to co-operative research projects in which the biometrician carries out the statistical part and assists in preparing the results for publication.

The Branch is also responsible for scientific computing and the staff prepare computer programmes and advise on their use.

Significant Administrative Developments

The biometrician's position at the Agricultural Research Centre, Yanco, has been transferred to the Agricultural Research Institute, Wagga, to make two positions there. The biometrical work at Yanco will be handled from Wagga.

Dr A. C. Gleeson returned to the Agricultural Research Centre, Tamworth, after completing a project at the University of New South Wales.

APPENDIX I

FINANCIAL SUMMARY FOR THE YEAR 1978-79

DEPARTMENTAL

The Department of Agriculture's day-to-day running costs are met from Consolidated Revenue Fund. Receipts from the administration of various Acts of Parliament, as well as contribution from the Commonwealth towards certain specified functions, are paid into the Consolidated Revenue Fund. Expenditure during 1978-79 by the Department totalled \$53,012,663 from Consolidated Revenue Fund, while revenue amounted to \$11,407,013. The expenditure of \$53,012,663 financed, among other things, such functions as:

	\$
● Cattle Tick Control	6,459,229
● Maintenance—Agriculture Colleges	2,232,722
● Biological and Chemical Research	2,787,142
● Maintenance of various research stations	7,023,548
● Animal Industries (including Dairying)	15,562,328

EXTENSION AND APPLIED RESEARCH

Apart from finance from Consolidated Revenue, the Commonwealth Government provides a special grant known as the "Commonwealth Extension Services Grant". Expenditure from this source amounted to \$2,363,539 during 1978-79 and was devoted entirely to Extension and Applied Research.

OTHER RESEARCH FINANCE

Funds provided by industry, semi-government bodies and special Commonwealth Government grants are utilized in many research programmes and projects conducted by the Department of Agriculture. The Department relies heavily on this finance for research work and these sources provided \$1,819,270 in 1978-79.

CAPITAL WORKS PROGRAMMES

Funds for various capital works programmes are provided from General Loan Account and Commonwealth Government Grants under the Advanced Education and Technical Training Acts. General Loan is financed by the State of New South Wales, while Advanced Education is financed by the Commonwealth. Technical Training is also wholly financed by the Commonwealth.

Expenditure in 1978-79 on capital works was \$2,398,234, which was made up of \$2,300,000 from General Loan, \$79,133 from Advanced Education and \$19,101 from Technical Training Funds.

ACCOUNTS OF DEPARTMENT OF AGRICULTURE

FOR THE YEAR 1978-79

The cost of maintaining the Department of Agriculture is met from the Consolidated Revenue Fund, whilst capital expenditure on buildings, equipment and permanent improvements to departmentally owned property is a charge on the General Loan Account.

In addition to these sources of funds, the Department is assisted in financing certain lines of research and development, together with the control of insect pests and animal diseases, by levies on industry and by grants from the Commonwealth, semi-government and public and private organizations. Operations in this category are reflected in a large number of accounts within the classification of "Special Deposits" Accounts. The operations on some of the more significant Special Deposits Accounts are detailed later in this report.

COMPARATIVE STATEMENT OF EXPENDITURE

Account	1977-78	1978-79	Variation
	\$	\$	\$
Consolidated Revenue Fund	49,549,203	53,012,663	3,463,460 (+)
General Loan Account	1,900,000	2,300,000	400,000 (+)
Special Deposits Accounts	29,381,278	26,640,351	2,740,927 (-)
	80,830,481	81,953,014	1,122,533 (+)

CONSOLIDATED REVENUE FUND EXPENDITURE

Following are details of expenditure from Consolidated Revenue Fund for the previous two years:

Division	1977-78	1978-79	Variation
	\$	\$	\$
Central Administration	9,002,180	9,187,436	185,256 (+)
Biological and Chemical Research	2,486,165	2,787,142	300,977 (+)
Plant Industry	3,833,715	3,949,130	115,415 (+)
Horticulture	3,535,931	3,688,529	152,598 (+)
Dairying	1,674,875	1,675,199	324 (+)
Research Services	6,656,443	7,023,548	367,105 (+)
Agricultural Colleges	2,113,131	2,232,722	119,591 (+)
Animal Industry—			
Head and District Offices*	11,869,185	13,887,128	2,017,943 (+)
Queensland Border	833,524	910,244	76,720 (+)
Tick Quarantine Areas	5,663,689	5,548,985	114,704 (—)
Royal Botanic Gardens	1,880,365	2,122,600	242,235 (+)
	49,549,203	53,012,663	3,463,460 (+)

* Includes State contribution to National Bovine Tuberculosis and Brucellosis Eradication Campaign, \$2,726,700. The amount provided for the State contribution to Bovine Tuberculosis and Brucellosis campaign was transferred to Special Deposits Account, details of which are given later in this report.

GENERAL LOAN EXPENDITURE 1978-79

Condobolin—	\$
Glasshouse	1,245
Cowra Agricultural Research Station—	
Laboratory/administration building	65,069
Glenfield Veterinary Research Station—	
Cottage	38,670
Animal House	53,700
Sewerage	3,000
Water supply	2,433
Griffith Viticultural Research Station—	
Laboratory/administration building	787
Narrabri Research Station—	
Glasshouse and laboratory	30,000
Orange Agricultural Research Station—	
Glasshouse	50,527
Laboratory/administration building	573,418
Queensland Border—	
Cottage, Mingoola	546
Richmond Dairy Research Centre—	
Air-conditioning	1,249
Rydalmere Biological and Chemical Research Institute—	
Bulk store	42
Electron microscope building	22,853
Insecticide resistance laboratory	202,559
Mushroom growth room	10,443
Tamworth Agricultural Research Station—	
Laboratory extensions	44,346
Staff amenities building	637
Trangie Agricultural Research Station—	
Glasshouse	1,716
Wagga Agricultural Research Institute—	
Extensions to laboratory	513,482
Yanco Agricultural Research Centre—	
Development	19,621
Glasshouse	28,648
Plant and equipment purchases for the whole Department	632,610
Road construction or renewal	2,398
	2,300,000

SPECIAL DEPOSITS ACCOUNT

Transactions on some of the more significant Special Deposits Accounts during 1978-79 are given below:

COMMONWEALTH GRANTS FOR STATE SECONDARY SCHOOLS, TECHNICAL TRAINING PROJECTS

These funds are made available by the Commonwealth under the States Grants (Technical Training) Acts. Works under the first triennium (1st July, 1965, to 30th June, 1968) were completed at a total cost of \$800,000, and works under the second triennium (1st July, 1968, to 30th June, 1971) were completed at a total cost of \$1,227,000. Works under the third triennium (1st July, 1971, to 30th June, 1974) are still in progress and \$2,582,811 has been spent to 30th June, 1979.

A summary of receipt and expenditure of funds under the third triennium is shown hereunder:

	\$	\$
Grant received from Commonwealth (including supplementation)		2,590,000
Expenditure to 30th June, 1978	2,563,710	
Expenditure 1978-79—		
C. B. Alexander Agricultural College—		
Accommodation, lecture, library complex	14,760	
Yanco Agricultural College—		
Hydraulics laboratory	\$ 2,677	
Water supply	1,664	
	4,341	2,582,811
Balance of funds available to complete third triennium		7,189

COMMONWEALTH GRANT FOR COLLEGES OF ADVANCED EDUCATION

Commonwealth legislation provides for grants towards State expenditure on advanced education for courses of instruction which comply with the conditions laid down in the Commonwealth Acts. Until 31st December, 1973, grants were made for the following three purposes:

- (1) Financing of major capital projects on a dollar for dollar basis by Commonwealth and State.
- (2) Recurrent expenditure (running costs). The Commonwealth contributed \$1 for every \$2.85 spent by the State.
- (3) Library purposes in the form of a direct grant from the Commonwealth.

Commencing on 1st January, 1974, Colleges of Advanced Education have been wholly financed by the Commonwealth Government, there being no further contributions by the State as set out in (1) and (2) above. However, the State was required to contribute 1/6th of the 1973-75 triennium Capital Works Programme.

Expenditure on the advanced education programme is summarized as follows:

Major capital projects	\$	\$	\$
First Triennium 1st January, 1967, to 31st December, 1969—			
Total expenditure			800,930
Second Triennium 1st January, 1970, to 31st December, 1972—			
Total expenditure			4,418,471
Third Triennium 1st January, 1973, to 31st December, 1975—			
Expenditure to 30th June, 1978		4,550,408	
Expenditure 1978-79—			
Hawkesbury Agricultural College—			
Plant Science building	2,196		
Field Service building	3,018		
P.A.B.X. Extensions	535		
Wagga Agricultural College—			
Animal and Plant Science Laboratory	513*		
Engineering building extensions	933*		
		7,195	
Total expenditure			4,557,603
Annual Allocation—1976—			
Expenditure to 30th June, 1978		15,678	
Expenditure 1978-79—			
Orange Agricultural College—			
Relocatable classroom		33,929	
			49,607
Annual Allocation—1977—			
Expenditure to 30th June, 1978		29,342	
Expenditure 1978-9		Nil	
			29,342
Annual Allocation—1978—			
Expenditure 1978-79—			
Orange Agricultural College—			
Purchase of equipment		21,841	
			21,841
Annual Allocation—1979—			
Expenditure 1978-79—			
Orange Agricultural College—			
Purchase of equipment		8,724	
			8,724
Total expenditure to 30th June, 1979			9,886,518

* In addition to this, \$7,559 (representing balance of unspent funds) was transferred to Riverina College of Advanced Education.

Library grants	\$	\$
Hawkesbury Agricultural College— Expenditure to 30th June, 1978 Expenditure 1978-79	50,435 NIL	50,435
Orange Agricultural College— Expenditure to 30th June, 1978 Expenditure 1978-79	34,690 NIL	34,690
Wagga Agricultural College— Expenditure to 30th June, 1978 Expenditure 1978-79	29,658 115*	29,773
		114,898

* In addition to this, \$852 (representing balance of unspent funds) was transferred to Riverina College of Advanced Education.

AUSTRALIAN DEVELOPMENT ASSISTANCE BUREAU WORKING ACCOUNT

The finance for Australian Development Assistance Bureau projects is provided by the Bureau. In addition to providing technical expertise and advice, the projects in various countries are managed by Departmental personnel. Details of the operations of the Special Deposits Account for the assistance are given below for the year ending 30th June, 1979:

	\$	\$	\$
Balance as at 1st July, 1978	..	..	1,678,681
Receipts during the year	..	2,794,379	..
Less Expenditures—			
Salaries and allowances	478,580	..	..
Travelling expenses	53,276	..	..
Materials and equipment	1,609,161	..	..
Other expenses	281,104	..	..
Overhead expenses	52,323	..	..
Advances	113,830	2,420,047	374,332
Balance at 30th June, 1979	..	..	2,053,013

SWINE COMPENSATION FUND

Following is a summary of operations on the Swine Compensation Fund for year ending 30th June, 1979:

	\$	\$
Balance in fund at 1st July, 1978	..	1,177,963
Receipts—		
Interest	..	104,500
		1,282,463
Payments—		
Compensation	1,844	..
Administration costs	5,386	..
Research costs	10,970	18,200
		1,264,263

CATTLE COMPENSATION FUND

	\$	\$
Balance as at 1st July, 1978	..	2,892,762
Receipts—		
Interest	213,900	..
Levies	23,492	..
Stamp duty	335,206	..
Commonwealth contributions Tuberculosis Reactors	15,487	..
Commonwealth contributions Brucellosis Reactors	1,356,569	1,944,654
		4,837,416
Payments—		
Compensations—		
National Tuberculosis	24,552	..
National Brucellosis	1,243,060	..
State Brucellosis	3,598	..
State Tuberculosis	8,219	..
State—Other Diseases	308	..
	1,279,737	..
Administration costs of Department	44,642	..
Payable to secretaries of Pastures Protection Boards	8,547	..
Payable to independent valuers	237	1,333,163
		3,504,253

CATTLE COMPENSATION PAYMENTS 1978-79*

	Numbers of claims				Numbers of animals				Payment details			
	REG 5	REG 6	Section 5 (1) E	TOTAL	REG 5	REG 6	Section 5 (1) E	TOTAL	\$ REG 5	\$ REG 6	\$ Section 5 (1) E	\$ TOTAL
Brucellosis	588	..	22	610	20,895	..	144	21,039	1,243,060	..	3,598	1,246,658
Tuberculosis	72	41	..	113	345	63	..	408	24,552	8,219	..	32,771
Tick Fever	1	..	..	1	1	..	..	1	158	..	..	158
Trichomoniasis	..	..	..	..	..	..	..	..	..	..	..	..
Johnes Disease	1	..	..	1	1	..	..	1	150	..	..	150
Vibrosis	..	..	..	..	..	..	..	..	..	..	..	..
Pleuro Pneumonia	..	..	..	..	..	..	..	..	..	..	..	..
Contagiosa	..	..	..	..	..	..	..	..	..	..	..	..
Totals	662	41	22	725	21,242	63	144	21,449	1,267,920	8,219	3,598	1,279,737

* This statistical information is supplied in connection with the compensation payments of \$1,279,737.

ERADICATION OF BOVINE TUBERCULOSIS AND BRUCELLOSIS WORKING ACCOUNT

	\$	\$
Balance in fund at 1st July, 1978		968,744
Income—		
Contributions by New South Wales		2,726,700
Contributions by Commonwealth		5,997,293
Fees for laboratory services rendered		1,188
		9,693,925
Expenditure—		
Salaries, wages and associated charges	5,297,747	
Travelling expenses	113,069	
Vehicle running costs	310,187	
Printing and requisites	32,156	
Postage and telephone	119,236	
Freight and cartage	80,591	
Equipment and materials	858,495	
Costs of tail tags	127,521	
Maintenance, rentals, advertising and sundries	169,239	
Payments to private practitioners—		
for tuberculosis testing	(\$455)	
for brucellosis testing	(\$687,919)	688,374
Administration costs		210,344
Purchase of plant and motor vehicles		280,447
Land, buildings and improvements		367,073
		8,654,479
Balance as at 30th June, 1979		1,039,446*

* Against this balance must be considered firm commitments of \$480,264 for capital items and \$555,625 for other items (in total \$1,035,890), leaving an actual credit balance of \$3,556.

COMMONWEALTH EXTENSION SERVICES GRANT

Name of item or project	Expenditure (\$)	
	1977-78	1978-79
Agronomy	447,825	480,728
Horticulture	96,570	120,301
Animal Industry	114,342	136,992
Dairying	46,862	40,856
Biometric Services	35,245	44,971
Extension Services	647,414	746,646
Engineering and Machinery Services	167,354	159,531
Publications	68,792	96,458
Library Services	51,758	90,599
Conference/Study Tours Overseas	24,778	21,819
In-Service Training	42,399	48,275
Post Graduate Training	2,105	32,084
Economic and Marketing Services	261,087	251,652
Biological and Chemical Services	146,127	92,627
Buildings and other major developments	41,313	NIL
	2,193,971	2,363,539

At the request of the Commonwealth Department of Primary Industry, the format for recording C.E.S.G. expenditure was altered for the 1978-79 programme and, in future, will be shown as follows:

Name of item or project	Expenditure (\$)
Regional/Developmental Research	1,000,775
Market and Marketing Information	51,321
Information Services	483,650
Farm Financial Management	88,172
Farm Organization and Operations Management	586,419
Staff Training and Development	101,428
Evaluation of Extension and Applied Research	11,125
Other Organizations	40,649
	2,363,539

AUSTRALIAN INNOCULANTS RESEARCH AND CONTROL SERVICE WORKING ACCOUNT

Following is a statement of receipts and payments for the above account for the year ended 30th June, 1979:

	\$	\$
Balance at 1st July, 1978		37,401
Receipts—		
Contributions from—		
New South Wales	19,140	
Queensland	7,540	
South Australia	7,540	
Tasmania	1,160	
Victoria	15,080	
Western Australia	7,540	
		58,000
		95,401
Payments—		
Salaries	47,297	
Operating Expenses	4,369	
		51,666
Balance as at 30th June, 1979		43,735

NOXIOUS INSECTS DESTRUCTION ACCOUNT

The Noxious Insects Act provides for the striking and collection of a levy under certain specified conditions. Moneys received from the levy are paid into a Special Deposits Account and applied by the Minister for purposes of the Act. Following is a financial statement of the operations of this account during 1978-79, which included costs associated with plague locust as well as spur-throated locust:

	\$	\$
Balance at 1st July, 1978		230,792
Receipts—		
Repayable Advance from New South Wales State Treasury	500,000	
Levies	487,192	
Sale of Assets	3,980	
		991,172
		1,221,964
Payments—		
Contribution to Australian Plague Locust Commission	288,144	
Equipment purchases	1,465	
Helicopter and aircraft hire	5,493	
Insecticide purchases	59,508	
Maintenance/repair of equipment	1,176	
Materials and sundry purchases including cyclone fencing	3,677	
Motor vehicle purchases	25,012	
Motor vehicle running costs	8,604	
Salaries	14,921	
Travelling expenses	5,030	
Postal and telex expenses	1,849	
		414,879
		807,085*

* Includes two repayable advances (\$250,000 made in 1976-77 and \$500,000 made in 1978-79).

VETERINARY SURGEONS ACT

The Act provides for the establishment of a Board of Veterinary Surgeons for New South Wales. Fees and penalties collected are paid to the credit of Consolidated Revenue Fund, from which the administrative expenses of the Boards are met. Following is a statement of receipts and payments for the year ended 30th June, 1979.

Receipts (\$)				Payments (\$)			
Roll fees	37,943			<i>Administration—</i>			
Registration fees	2,142			Salaries	23,033		
Restoration fees	645			Legal fees	650		
				Members fees	2,258		
				Travelling expenses	1,400		
				Printing, stationery	240		
				Postage and minor expenses	1,593		
				<i>Investigation Committee—</i>			
				Members fees	590		
				Members travelling	980		
				<i>Disciplinary Tribunal—</i>			
				Complaint fees refunds	260		
				Excess receipts over payments	9,726		
	40,730						40,730

MEAT INSPECTION SERVICE

The Meat Inspection Service is administered by virtue of the Meat Industry Act, which makes provision for a scale of fees. Following is a statement of receipts and costs associated with this Service, for the year ended 30th June, 1979.

	\$	\$
Receipts from inspection fees	..	5,730,705
<i>Less</i>		
Salaries, wages and associated items	4,909,512	..
Travelling expenses and motor vehicle running costs	304,640	..
General stores, freight and cartage	61,567	..
Books, periodicals and printing	2,504	..
Rent, cleaning, phone, electricity and postage	9,578	..
Laundry expenses	8,782	..
Sundry expenses	831	5,297,414
Net gain on Meat Inspection Service	..	433,291*

* Overhead expenses of \$875,781 to cover administration charges, workers compensation insurance premium, payroll tax and employers contribution to superannuation funds not charged direct should also be taken into account. The overall net loss on the Meat Inspection Service is then \$442,490.

FUND CREATED BY WHEAT MARKETING (BARRING OF CLAIMS) ACT

Revenue Account for year ended 30th June, 1979

	\$	\$
Interest on investments and savings bank interest	6,640	
Return and repayments of grants unused	36	6,676
Transfer of unutilized revenue to accumulated funds	276	
Commitments entered into during the year	6,400	6,676

Balance Sheet as at 30th June, 1979

Liabilities (\$)				Assets (\$)			
Accumulated Fund—				Investments in Government securities			
Balance 1st July, 1979	110,582			(face value)	106,000		
Unutilized revenue 30th June, 1979	276			Commonwealth Bank savings	6,295		
Previous year's commitments not required	156	111,014		Accrued interest	1,219		
Commitments 30th June, 1979		2,500					
		113,514					113,514

STATEMENT OF RECEIPTS—CONSOLIDATED REVENUE FUND

Year ended 30th June, 1979

Receipts for services rendered													\$
Rents	..	..	..	..	..	..	..	..	..	..	..	..	149,651
Student fees	..	..	..	..	..	..	..	..	..	..	..	..	226,041
Fees—													
Witnesses and jurors	..	..	..	..	..	..	..	..	..	..	..	..	424
Apiary registrations	..	..	..	..	..	..	..	..	..	..	..	..	23,311
Dairy Industry Act	..	..	..	..	..	..	..	..	..	..	..	..	435
Farm produce agents	..	..	..	..	..	..	..	..	..	..	..	..	530
Fertilizers Act	..	..	..	..	..	..	..	..	..	..	..	..	5,512
Pest Destroyers Act	..	..	..	..	..	..	..	..	..	..	..	..	7,450
Poultry Processing Act	..	..	..	..	..	..	..	..	..	..	..	..	2,080
Stock brand registrations	..	..	..	..	..	..	..	..	..	..	..	..	20,511
Stock Foods and Medicines Act	..	..	..	..	..	..	..	..	..	..	..	..	68,362
Swine brand registrations	..	..	..	..	..	..	..	..	..	..	..	..	1,554
Veterinary Surgeons Act	..	..	..	..	..	..	..	..	..	..	..	..	40,470
Contributions from Commonwealth—													
for administration of plant quarantine	..	..	..	..	..	..	..	..	..	..	..	..	1,257,533
for administration of animal quarantine	..	..	..	..	..	..	..	..	..	..	..	..	459,074
for administration of Commerce Act	..	..	..	..	..	..	..	..	..	..	..	..	320,181
for maintenance of gardens at Admiralty House	..	..	..	..	..	..	..	..	..	..	..	..	59,532
for export certification of livestock	..	..	..	..	..	..	..	..	..	..	..	..	91,788
from CSIRO for cotton research	..	..	..	..	..	..	..	..	..	..	..	..	86,784
Fees—													
Dipping	..	..	..	..	..	..	..	..	..	..	..	..	54,037
Inspection—Plant Diseases Act	..	..	..	..	..	..	..	..	..	..	..	..	21,089
Inspection—Meat Industry Act	..	..	..	..	..	..	..	..	..	..	..	..	5,730,705
Herd recording	..	..	..	..	..	..	..	..	..	..	..	..	297,917
Seed certification and testing	..	..	..	..	..	..	..	..	..	..	..	..	23,624
Miscellaneous	..	..	..	..	..	..	..	..	..	..	..	..	49,681
Administration costs—Cattle Compensation Fund	..	..	..	..	..	..	..	..	..	..	..	..	44,809
Administration costs—Swine Compensation Fund	..	..	..	..	..	..	..	..	..	..	..	..	4,560
Commission on premium, collected	..	..	..	..	..	..	..	..	..	..	..	..	27,413
Miscellaneous receipts for services rendered	..	..	..	..	..	..	..	..	..	..	..	..	506,363
Total receipts for services rendered	..	..	..	..	..	..	..	..	..	..	..	..	9,581,422
General miscellaneous receipts—													
Rents (excluding land, buildings, premises)	..	..	..	..	..	..	..	..	..	..	..	..	32,920
Fines and forfeitures (including bond liability)	..	..	..	..	..	..	..	..	..	..	..	..	3,105
Interest	..	..	..	..	..	..	..	..	..	..	..	..	739
Sale of farm produce	..	..	..	..	..	..	..	..	..	..	..	..	862,397
Sale of Government property	..	..	..	..	..	..	..	..	..	..	..	..	98,088
Repayments to credit of previous year's votes	..	..	..	..	..	..	..	..	..	..	..	..	263,217
Transfer of part balances of Special Deposits Accounts no longer required	..	..	..	..	..	..	..	..	..	..	..	..	2,349
Miscellaneous unclassified receipts	..	..	..	..	..	..	..	..	..	..	..	..	7,704
Pastures Protection Boards 3 per cent contribution	..	..	..	..	..	..	..	..	..	..	..	..	157,459
Employers liability to State Superannuation Fund	..	..	..	..	..	..	..	..	..	..	..	..	386,665
Sale of publications	..	..	..	..	..	..	..	..	..	..	..	..	10,948
Total miscellaneous receipts	..	..	..	..	..	..	..	..	..	..	..	..	1,825,591
Total—ALL RECEIPTS	..	..	..	..	..	..	..	..	..	..	..	..	11,407,013

APPENDIX II

DIVISION OF ANIMAL INDUSTRY

N.S.W. Department of Agriculture Publications

- Anon. (1978). Tattoo ear marking of calves. *Division of Animal Industry Bulletin* A0.2.1.
- Archer, J. F. and Walker, K. H. (1979). Sarcosporidiosis—research sheds new light on an old problem in the sheep industry. *Agricultural Gazette of N.S.W.* 90 (3): 11.
- Armstrong, P. (1978). Farm feed mixing—does it pay. *Poultry Notes* October: 23.
- Armstrong, P. and Bolla, G. K. (1978). Approved pesticides for poultry farms. *Poultry Notes* October: 44.
- Armstrong, P. and Mohr, G. (1978). The N.S.W. poultry industry—value of production. *Poultry Notes* October: 3.
- Baillie, B. (1979). Skin fold can affect lambing percentage. *Agricultural Gazette of N.S.W.* 90 (3): 4.
- Bolla, G. K. (1979). The effects of noxious gases in broiler sheds. *Poultry Notes* April: 18.
- Bolla, G. K. (1979). What colour curtains for poultry sheds? *Poultry Notes* January: 20.
- Butterworth, J. D. (1979). Brucellosis in cattle. *Division of Animal Industry Bulletin* A2.9.1.
- Chaseling, P. D. (1978). Poultry new equipment awards—1978. *Poultry Notes* July: 14.
- Cockram, F. A. (1979). Koalas with diseased eyes are best left alone. *Agricultural Gazette of N.S.W.* 90 (3): 38.
- Dent, C. H. R. (1979). Vaccination controls vibriosis in cattle. *Agricultural Gazette of N.S.W.* 90 (2): 6.
- Dicker, R. W. (1978). The bush tick—an important cattle pest. *Agricultural Gazette of N.S.W.* 89 (4): 10.
- Donnelly, F. (1979). Skin folds affect merino production. *Agricultural Gazette of N.S.W.* 90 (3): 2.
- Fogarty, M. N. (1978). The Dorset Horn: its history and how it developed. *Agricultural Gazette of N.S.W.* 89 (6): 28.
- Freer, R. E. and Boyle, A. J. (Division of Extension Services) (1978). Calf creeps—a beef management aid. *Division of Animal Industry Bulletin* A2.2.1.
- Gilchrist, P. T. (1978). Pullorum disease. *Division of Animal Industry Bulletin* A5.9.4.
- Gilchrist, P. T. (1978). Overseas study tour of poultry health. *Poultry Notes* April: 22.
- Gilchrist, P. T. (1978). A “new” poultry disease. *Poultry Notes* July: 11.
- Gilchrist, P. T. (1979). Protecting poultry from exotic disease. *Agricultural Gazette of N.S.W.* 90 (3): 14.
- Gilchrist, P. T. (1979). Vaccination of poultry. *Division of Animal Industry Bulletin* A5.2.1.
- Hassab, P. and Begg, C. (1979). Raise pigs better with these ideas. *Agricultural Gazette of N.S.W.* 90 (2): 8.
- Hoare, R. J. T., Sheldrake, R. F. and Critchley, D. (1978). Cell counts reduced by good management. *Dairy Topics* 21: 17.
- Hone, J. and Waithman, J. (1979). Feral pigs are spreading. *Agricultural Gazette of N.S.W.* 90 (2): 12.
- Horn, R. (1978). Workshop for layer servicemen. *Poultry Notes* October: 35.
- Horn, R. (1979). Use of electric fences in poultry production. *Poultry Notes* April: 14.
- Horn, R., Mohr, G. and Gilchrist, P. (1979). Single age layer farms. *Poultry Notes* April: 3.
- Horn, R. and Sanders, J. (1979). Comparison of field flock performance with the 25th N.S.W. random sample layer test flocks 1976–8. *Poultry Notes* January: 12.
- Hornitzky, M., White, B. and Ward, B. (1978). A disease of bees—European brood disease. *Agricultural Gazette of N.S.W.* 89 (5): 7.
- Keys, M. J. (1978). Litter materials and management—possible alternatives. *Poultry Notes* July: 28.
- Korn, T. J. (1978). Be a horse judge. *Agricultural Gazette of N.S.W.* 89 (5): 41.
- McKiernan, W. A. (1979). Horse yards and handling facilities. *Division of Animal Industry Bulletin* A6.7.1.
- McMahon, P. J. (1978). Research in progress at Seven Hills. *Poultry Notes* July: 22.
- McMahon, P. J. (1979). Date stamping egg cartons. *Poultry Notes* April: 26.
- McMahon, P. J. (1979). Research programmes at Seven Hills. *Poultry Notes* January: 7.
- Macindoe, R. N. (1978). Convention Proceedings. *Poultry Notes* July: 21.
- Macindoe, R. N. (1979). Storage and retrieval. *Poultry Notes* January: 22.
- Macindoe, R. N. (1979). Workshops for poultry people. *Poultry Notes* January: 3.
- Mackay, B. I. (1979). Feeding your horse. *Agricultural Gazette of N.S.W.* 90 (2): 30.
- Mackay, B. I. (1979). Feeding your horse. *Division of Animal Industry Bulletin* A6.5.1.
- May, T. J. (1978). Annual show adopts objective measurement wool class. *Agricultural Gazette of N.S.W.* 89 (6): 30.
- Mort, P. (1979). Lupins valuable protein supplement for pigs. *Agricultural Gazette of N.S.W.* 90 (1): 24.
- Nowland, W. J. and Pym, R. A. E. (1978). 1978 Random sample broiler test. *Poultry Notes* October: 13.
- Nowland, W. J. (1978). Pheasant raising. *Division of Animal Industry Bulletin* A9.2.1.
- Oddy, V. H. (1978). Feed requirements of sheep and cattle during drought using a metabolizable energy system. *Ag Bulletin* 3.
- Perry, D. A. (1979). Effective flystrike control at minimum cost. *Agricultural Gazette of N.S.W.* 90 (3): 7.
- Randall, M. C. and Sheridan, A. K. (1979). Final report 26th random sample laying test. *N.S.W. Department of Agriculture*.
- Sanders, J. (1978). Layer performance. *Poultry Notes* October: 36.
- Seaman, J. T. (1978). Paterson's curse is a curse for horses. *Agricultural Gazette of N.S.W.* 89 (5): 43.

- Sheldrake, R. F. and Hoare, R. J. T. (1979). How to use iodine dips and emollients. *Dairy Topics* **21**: 20.
- Simpson, I. H. and Robinson, G. G. (1978). Grazing systems for perennial pastures. *Agricultural Gazette of N.S.W.* **89** (6): 26.
- Skillman, G. J. (1978). Importing animal products can be a risky business. *Agricultural Gazette of N.S.W.* **89** (4): 38.
- Skillman, G. J. and Carter, G. C. (1979). A first line of defence—The Animal Quarantine Service. *Division of Animal Industry Bulletin* **A0.9.1**.
- Slennett, G. D. (1978). Are you getting the best performance from your broilers? *Poultry Notes* July: 3.
- Slennett, G. D. (1978). The N.S.W. chicken meat industry. *Agricultural Gazette of N.S.W.* **89** (5): 28.
- Upton, W. H. (1978). Irrigated summer forage crops for beef cattle. *Agricultural Gazette of N.S.W.* **89** (4): 40.

Contributions to Journals

- Batterham, E. S. (1979). *Lupinus albus* cv. Ultra and *Lupinus angustifolius* cv. Unicrop as protein concentrates for growing pigs. *Australian Journal of Agricultural Research* **30**: 369.
- Batterham, E. S., Murison, R. D. and Lewis, C. E. (1979). Availability of lysine in protein concentrates as determined by the slope-ratio assay with growing pigs and rats and by chemical techniques. *British Journal of Nutrition* **41**: 383.
- Burton, R. W. (1979). A technique in the X-raying of birds for tibial dyschondroplasia. *Journal of American Veterinary Radiology Society* **20**.
- Campbell, N. J., Gregg, P. (University of Sydney), Kelly, J. D., (University of Sydney) and Dineen, J. K. (CSIRO) (1978). Failure to induce homologous immunity to *Fasciola hepatica* in sheep vaccinated with irradiated metacercariae. *Veterinary Parasitology* **4**: 143.
- Campbell, N. J., Kelly, J. D. (University of Sydney) and Dineen, J. K. (CSIRO) (1978). The effect of age of host in resistance expressed at the gut level in rats infected with *Fasciola hepatica*. *Veterinary Parasitology* **4**: 317.
- Campbell, N. J. and Hall, C. A. (1979). The anthelmintic efficacy of albendazole against *Fasciola hepatica* and benzimidazole resistant strains of *Haemonchus contortus* and *Trichostrongylus colubriformis* in sheep. *Research in Veterinary Science* **26**: 90.
- Chick, B. F. and Bosu, W. T. (University of Guelph) and Basrur, P. K. (University of Guelph) (1978). Clinical pathological and cytogenetic observations in two intersex dogs. *The Cornell Veterinarian* **68** (3): 375.
- Chick, B. F. (1979). Ischaemic embolic myelopathy in a labrador crossbred dog. *Canadian Veterinary Journal* **20**: 84.
- Claxton, P. D. with Cross, G. M. J. (Private Industry) (1979). Serological classification of Australian strains of *Erysipelothrix rhusiopathiae* isolated from pigs, sheep, turkeys, and man. *Australian Veterinary Journal* **55**: 77.
- Cockram, F. A. and Stephens, J. R. (Department of Primary Industry) (1979) Viriosis and trichomoniasis in beef bulls in N.S.W. *Australian Veterinary Journal* **55**: 252.
- Cohen, R. D. H. (1978). Future pasture research. Where to now? *Tropical Grasslands* **12**: 141.
- Cohen, R. D. H. with Langlands, J. P. (CSIRO) (1978). The nutrition of ruminants grazing native and improved pastures 3. Mineral composition of bones and selected organs from grazing cattle. *Australian Journal of Agricultural Research* **29**: 1301.
- Cook, R. W. and Williams, J. F. (Michigan State University, U.S.A.) (1978). Surgical removal of the pyloric antrum in weaning rats. *Laboratory of Animal Science* **28**: 437.
- Croft, J. D. and Hone, L. J. (1978). The stomach contents of foxes, *Vulpes vulpes* collected in N.S.W. *Australian Wildlife Research* **5**: 85.
- Dent, C. H. R. and Howkins, A. B. (Canberra College of Advanced Education) (1978). A survey of canine cestodes in the Blayney Shire of N.S.W. *Australian Veterinary Journal* **54**: 452.
- Dineen, J. K., Kelly, J. D. and Campbell, N. J. (1978). Further observations in the nature and significance of cross protection generated in sheep against *Fasciola hepatica* by infection with *Cisticercus tenuicollis*. *International Journal of Parasitology* **8**: 360.
- Gard, G. P. with Saleh, F. (University of Alabama) and Compans, R. W. (University of Alabama) (1979). Synthesis of tacaribe viral proteins. *Virology* **93**: 369.
- Greer, E. B. and Lewis, C. E. (1978). Mineral and vitamin supplementation of diets for growing pigs 1. Wheat-based diets and the effect of preventing cross-coprophagy on the response to supplementation. *Australian Journal of Experimental Agriculture and Animal Husbandry* **18**: 688.
- Greer, E. B. (1978). Mineral and vitamin supplementation of diets for growing pigs (Thesis summary). *Journal of the Australian Institute of Agricultural Science* **44**: 49.
- Greer, E. B., Croft, M. G. and Lewis, C. E. (1979). Mineral and vitamin supplementation of diets for growing pigs 4. Effect of copper, zinc and iron supplements in a wheat/animal protein diet on performance, liver mineral stores and backfat quality. *Australian Journal of Experimental Agriculture and Animal Husbandry* **19**: 312.
- Hall, C. A. (1978). The efficiency of cypermethrin (NRDC 149) for the treatment and eradication of the sheep louse *Damalinia ovis*. *Australian Veterinary Journal* **54**: 471.
- Hall, C. A., Campbell, N. J. and Richardson, N. J. (1978). Levels of benzimidazole resistance to *Haemonchus contortus* and *Trichostrongylus colubriformis* from an egg hatch test procedure. *Research in Veterinary Science* **25**: 360.
- Hall, C. A., Campbell, N. J. and Carroll, S. N. (Pastures Protection Board, Yass) (1979). Resistance to thiabendazole in a field population of *Ostertagia circumcincta* from sheep. *Australian Veterinary Journal* **55**: 229.
- Hall, C. A., with Kelly, J. D. (University of Sydney), Whitlock, H. V. (University of Sydney), Thompson, H. G. (University of Sydney), Martin, I. C. A. (University of Sydney) and Le Jambre, L. F. (CSIRO) (1978). Physiological characteristics of free-living and parastic stages of strains of *Haemonchus contortus* susceptible or resistant to benzimidazole anthelmintics. *Research in Veterinary Science* **25**: 376.
- Hall, C. A., Kelly, J. D. (University of Sydney), Campbell, N. J., Whitlock, H. V. (University of Sydney) and Martin, I. C. A. (University of Sydney) (1978). The dose response of several benzimidazole anthelmintics against resistant strains of *Haemonchus contortus* and *Trichostrongylus colubriformis* selected with thiabendazole. *Research in Veterinary Science* **25**: 364.
- Hamilton, B. A. (1978). Grass seed contamination of sheep carcasses. *Wool Technology and Sheep Breeding* **26**: 15.
- Hamilton, B. A. and Denney, G. D. (1978). A comparison of methods of recovering oesophageal extrusa from grazing sheep. *Journal of the British Grassland Society* **33**: 307.
- Hamilton, B. A., Greenup, L. R. and Lodge, G. M. (1978). Seedling mortality of lucerne varieties in field plots subjected to spotted alfalfa aphid. *Journal of the Australian Institute of Agricultural Science* **44**: 54.
- Healy, P. J., Turvey, W. S. and Willats, H. G. (1978). Interference in estimation of serum copper concentration resulting from use of silicone-coated tubes for collection of blood. *Clinica Chimica Acta* **88**: 573.
- Healy, P. J., Nicholls, P. J. and Butrej, P. (1978). A granulocyte test for detection of cattle heterozygous and mannosidosis. *Clinica Chimica Acta* **88**: 429.
- Healy, P. J. and Dinsdale, D. (1979). Protein transmission in the intestine of the newborn lamb. *Histochemical Journal* **11**: 289.

- Heath, A. B. and Black, R. R. (1979). Investigation and simplification of the sweep co-distillation technique for pesticide residue analysis in animal fats. *Journal of the Association of Official Analytical Chemists* **61**: 1516.
- Hennessy, D. W. (1978). Nutritional deficiencies of pastures for beef production on the North Coast. *Tropical Grasslands* **12**: 142.
- Hennessy, D. W., Nolan, J. V. (University of New England), Norton, B. W. (University of New England), Ball, F. M. (University of New England) and Leng, R. A. (University of New England) (1978). Response of beef cattle to infused supplements of urea and of urea-molasses when offered a low quality grass hay. *Australian Journal of Experimental Agriculture and Animal Husbandry* **18**: 477.
- Hennessy, D. W. and Robinson, G. G. (1979). Herbage intake, eating behaviour and calf production of beef cows grazing improved pastures on the Northern Tablelands of N.S.W. *Australian Journal of Experimental Agriculture and Animal Husbandry* **19**: 261.
- Husband, A. J. (1978). An immunisation model for the control of infectious enteritis. *Research in Veterinary Science* **25**: 173.
- Husband, A. J. and Gowans, J. L. (University of Oxford) (1978). The origin and antigen-dependent distribution of IgA-containing cells in the intestine. *Journal of Experimental Medicine* **148**: 1146.
- Husband, A. J. and McDowell, G. H. (University of Sydney) (1978). Immunity to experimental enteritis in lambs vaccinated prenatally. *Research in Veterinary Science* **25**: 343.
- Husband, A. J. and Watson, D. L. (James Cook University, Townsville) (1978). Immunity in the intestine. *Veterinary Bulletin* **48**: 911.
- Kaiser, A. G., England, P., Gibbs, B. G., and Taylor, J. C. (Reading University, United Kingdom) (1978). The effect of level of formaldehyde applied at ensiling on the utilisation of red clover silage by young calves. *Animal Production* **26**: 363.
- Lee, G. J., McManus, W. R. (University of N.S.W.), Cottle, D. J. (University of New England), Jackson, G. D. F. and Black, Janet (1978). Toxicity to mice of rumen fluid from sheep fed roughage or concentrate diets. *Research in Veterinary Science* **24**: 388.
- McGuirk, B. J., Atkins, K. D., Kowal, E., and Thornberry, K. (1978). Breeding for resistance to fleece-rot and body strike—The Trangie programme. *Wool Technology and Sheep Breeding* **26**: 17.
- Machin, M. V. and McDougall, K. W. (1978). Determination of amitraz in cattle dipping baths and sprays. *Journal of the Association of Official Analytical Chemists* **61**: 1516.
- Mumford, D. H. (1978). Equine infectious anaemia in N.S.W. *Australian Veterinary Journal* **54**: 597.
- Plant, J. W., Marchant, R., Mitchell, T. D. and Giles, J. R. (National Parks and Wildlife Service) (1978). Neonatal lamb loss due to feral pig predation. *Australian Veterinary Journal* **54**: 426.
- Pym, R. A. E. and Nicholls, P. J. (1979). Selection for food conversion in broilers: Direct and correlated responses to selection for bodyweight gain, food consumption and food conversion ratio. *British Poultry Science* **20**: 73.
- Pym, R. A. E. and Solvyns, A. J. (1979). Selection for food conversion in broilers: Body composition of birds selected for increased bodyweight gain, food consumption and food conversion ratio. *British Poultry Science* **20**: 87.
- Pym, R. A. E. and James, J. W. (University of N.S.W.) (1979). Selection for food conversion in broilers: Predicted responses to selection for economic efficiency. *British Poultry Science* **99**: 107.
- Restall, B. J., Kearins, R. D., Herdgen, I. and Carberry, P. (1978). The induction of reproductive activity in lactating ewes. *Australian Journal of Agricultural Research* **29**: 181.
- Rogan, I. M. and Fowler, D. G. (1978). Reproductive performance in Merino flocks where ram percentage is less than one. *Proceedings Australian Society of Reproductive Biology* **10**: 21.
- Shepherd, N. C., Gee, C. D. (Pastures Protection Board, Goulburn), Jessep, T., Timmins, G. (Pastures Protection Board, Cooma), Carroll, S. N. (Pastures Protection Board, Yass) and Bonner, R. B. (1978). Congenital bovine epizootic arthrogryposis and hydranencephaly. *Australian Veterinary Journal* **54**: 171.
- Skillman, G. J. (1978). The pressures on the Quarantine Service. *Animal Quarantine* **5** (4): 17.
- Tyrell, R. N. and Plant, J. W. (1979). Rectal damage in ewes following pregnancy diagnosis by rectal abdominal palpation. *Journal of Animal Science* **48**: 348.
- Walker, K. H., Cooper, K. and Jackson, C. A. W. (1979). *Pasteurella multocida* as a cause of arthrosynovitis and tenosynovitis in broiler chickens. *Australian Veterinary Journal* **55**: 250.
- Watts, J. E., Dash, K. M. (CSIRO) and Lisle, K. A. (CSIRO) (1978). The effect of anthelmintic treatment and other management factors on the incidence of breech strike in merino sheep. *Australian Veterinary Journal* **54**: 352.
- Watts, J. E. and Luff, R. L. (1978). The importance of the Radical Mules Operation and tail length for the control of breech strike in scouring merino sheep. *Australian Veterinary Journal* **54**: 356.
- Watts, J. E. with Merritt, G. C. (CSIRO) (1978). An *in-vitro* technique for studying fleece-rot and fly strike in sheep. *Australian Veterinary Journal* **54**: 513.
- Watts, J. E. with Merritt, G. C. (CSIRO) (1978). The changes in protein concentration and bacteria of fleece and skin during the development of fleece-rot and body strike in sheep. *Australian Veterinary Journal* **54**: 517.
- Webb, R. F., Jackson, A. R. B. and McCully, C. H. (1978). The efficiency of various anthelmintics against field populations of *Haemonchus contortus* resistant to thiabendazole. *Australian Veterinary Journal* **54**: 501.
- Webb, R. F. and Le Jambre, L. F. (CSIRO) and Martin, P. J. (CSIRO) (1979). Thiabendazole resistance in field populations of *Haemonchus contortus*. *Australian Veterinary Journal* **55**: 163.
- Webb, R. F., McCully, C. H. and Adams, B. S. (1979). The efficiency of oxfendazole against four field populations of benzimidazole resistant *Haemonchus contortus*. *Australian Veterinary Journal* **55**: 249.
- Worthing, Carol A. and Kennedy, J. P. (University of N.S.W.) (1979). Ovarian response to exogenous hormones in 6-week-old lambs. *Australian Journal of Biological Science* **32**: 91.

Contributions to Technical Conferences

- Atkins, K. D. (1979). Breeding for resistance to body strike. *Proceedings of the National Symposium on Sheep Blowfly and Flystrike in Sheep*, Sydney p. 145.
- Atkins, K. D. (1979). Strain comparison research. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 15.
- Baillie, B. G. (1979). Fleece measurement—its application to ram marketings. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 6.
- Baillie, B. G. (1979). Management practices for controlling flystrike. *Proceedings of the National Symposium on Sheep Blowfly and Flystrike in Sheep*, Sydney p. 159.
- Batterham, E. S. (1978). Lysine utilization and availability. *Conference on Criteria for Evaluation of Australian Feedstuffs—Australian Pig Industry Research Committee*, Sydney.
- Bell, A. K. (1979). Practical breeding plans. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 5.
- Bennett, N. W. (1979). Wool marketing options. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 17.
- Brunskill, A. (1979). Principles of British breed stud breeding. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 7.

- Cahill, J. R. (1979). Practical breeding plans for tablelands merino studs. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 3.
- Clark, F. L. (1979). Field aspects of selenium deficiency in ruminants in N.S.W. *Australian Advance: in Veterinary Science*, Townsville 0. 48.
- Cohen, R. D. H. (1979). Better pastures for better beef. In *The economics of using superphosphate in beef production* (Ed. R. J. Smith) *Proceedings of a workshop for Bankers, Accountants and Agents*, Grafton March 1979.
- Cook, R. W. (1979). Comparative pathology of genitalia of the pig. *Genital Pathology Training Course of the World Association of Veterinary Pathologists—Australian Branch, Annual Conference of Australian Veterinary Association James Cook University*, Townsville Course Notes p. 64.
- Dickinson, D. A. (1979). Current control measures for *Boophilis microplus* in N.S.W. *Australian Advances in Veterinary Science*, Townsville p. 69.
- Donnelly, F. B. (1979). Technique, equipment, field trial results of pizzle dropping. *Proceedings of the National Symposium on Sheep Blowfly and Flystrike in Sheep*, Sydney p. 189.
- Donnelly, F. B. (1979). Principles of merino breeding. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 1.
- Eamens, G. J. (1978). Ulcerative balanitis and balanoposthitis in Border Leicester rams—laboratory aspects. *N.S.W. Veterinary Proceedings* Sydney 14: 25.
- Eamens, G. J. (1979). Respiratory disease—bacterial, fungal and parasitic. *Proceedings No. 427, Cattle Diseases, University of Sydney Post Graduate Committee in Veterinary Science* p. 257.
- Ferguson, B. D. (1979). Principles of management for increased reproduction. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 12.
- Ferguson, B. D. (1979). Sheep field trials. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 18.
- Fowler, D. C. (1978). An explanation of the higher fecundity of Booroola Merinos. *Proceedings Australian Society of Reproductive Biology* 10: 24.
- Greer, E. B. (1978). Growing pig diets and the place for added minerals and vitamins. *International Training Course in Pig Husbandry. Australian Development Assistance Bureau* Canberra p. 78.
- Hall, C. A. (1978). A new concept for blowfly control. *N.S.W. Veterinary Proceedings*, Sydney 14: 33.
- Hall, C. A. (1979). Recent developments in internal parasites in sheep. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga, p. 23.
- Hall, C. A. Moisture content of the fleece and the control of body strike. *Proceedings of the National Symposium on Sheep Blowfly and Flystrike in Sheep*, Sydney p. 141.
- Hall, D. G., Wolfe, E. C. and Southwood, O. R. (1978). The response of pregnant ewes to drought affected pastures. *Proceedings of the Australian Society of Animal Production*, Melbourne 12: 162.
- Hall, D. G. (1979). Lot feeding of lambs. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 24.
- Harris, D. C. (1979). Performance recording schemes—their use in N.S.W. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 9.
- Harris, D. C. (1979). Middle East sheep trade and its requirements *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 25.
- Hart, K. G. (1978). Comments on the biology of feral pigs in the Braidwood Pastures Protection district. *Proceedings of 61st Annual Conference of the Association of Veterinary Inspectors of N.S.W.*, Sydney p. 65.
- Healy, P. J. (1979). Congenital diseases—heritable. *Proceedings No. 42 Cattle Diseases, University of Sydney Post Graduate Committee in Veterinary Science*, p. 253.
- Healy, P. J. (1979). Copper deficiency in ruminants. *Australian Advances in Veterinary Science*, Townsville, p. 47.
- Hoare, R. J. T. (1979). Mastitis and teat condition. *Proceedings No. 42 Cattle Diseases' University of Sydney Post Graduate Committee in Veterinary Science*, p. 229.
- Hornitzky, M. (1978). Some problems with bees and trout. *Proceedings of 61st Annual Conference of the Association of Veterinary Inspectors of N.S.W.*, Sydney p. 75.
- Husband, A. J. and McDowell, G. H. (University of Sydney) (1978). The cellular and humoral response to oral immunisation in the foetal lamb. *Proceedings of 3rd International Symposium on Immunology of Reproduction*, Bulgaria p. 664.
- Husband, A. J. (1979). An immunisation model for the stimulation of IgA immunity in the ruminant intestine. *Proceedings of Annual Meeting of Australian Society for Immunology*, University of Melbourne, August 1978, p. 24.
- Jackson, C. A. W. (1979). Control of infectious bursal disease by vaccination of parent breeding flocks. *Proceedings of Australian Chicken Meat Research Seminar on Avian Viruses*, Sydney p. 12.
- Jackson, C. A. W. (1979). Vaccination against marek's disease with an avirulent marek's disease virus vaccine. *Proceedings of Australian Chicken Meat Research Seminar on Avian Viruses*, Sydney p. 8.
- Jackson, C. A. W. and Robinson, S. (Private Industry) (1979). Spray and aerosol immunisation of chickens at an early age against infectious bronchitis. *Proceedings of Australian Chicken Meat Research Seminar on Avian Viruses*, Sydney p. 14.
- Kaiser, A. G., England, P. (Reading University, United Kingdom) and Osbourn, D. F. (Reading University, United Kingdom) (1978). Intake and digestion of formaldehyde—treated silages by young growing cattle. *Proceedings of the 5th Silage Conference*, Ayr, Scotland.
- Killeen, I. D. (1979). Practical implications of seasonal anoestrus to sheep and wool production. *Proceedings of the Workshop on the Seasonal Control of Reproduction in Sheep*, CSIRO Prospect.
- Killeen, I. D. (1979). Developments in controlled breeding. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 22.
- Lee, G. J. (1978). Use of the computer in dairy rations: Linear programming. *Proceedings of Division of Dairying Officers Conference*, Hawkesbury Agricultural College, Richmond p. 32.
- Littlejohns, I. R. (1978). Mucosal disease and its familial incidence. *Proceedings of 61st Annual Conference of the Association of Veterinary Inspectors of N.S.W.* p. 71.
- Littlejohns, I. R. (1979). Respiratory diseases in cattle—Viral, Chlamydial and Mycoplasmal. *Proceedings No. 42, Cattle Diseases, University of Sydney Post Graduate Committee in Veterinary Science*, p. 455.
- Luff, A. F. (1979). Management for increased wool growth and body growth. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 10.
- Mangelsdorf, N. W. (1979). Practical breeding plans for British and Australasian meat breed studs. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 8.
- McGuirk, B. J. (1979). Principles of merino breeding. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 2.
- Mitchell, T. D. (1979). Goat production in Australia. *Seminar on Goat Development in Asia*, Karnal, India.
- Mitchell, T. D. (1979). Towards better fleece production. *Proceedings of 2nd Annual Technical Workshop Angora Breed Society*, Sydney.
- Mulholland, J. G. (1979). Stubble utilization and urea feeding. *Proceedings of Sheep and Wool Seminar*, Wagga Wagga p. 20.

- Mumford, D. H. (1978). Animal disease control in N.S.W. *Proceedings of 61st Annual Conference of the Association of Veterinary Inspectors of N.S.W.*, p. 19.
- Mumford, D. H. (1978). An overview of the activities of the Department of Agriculture in relation to veterinary practice. *N.S.W. Veterinary Proceedings*, 14: 27.
- Mylrea, P. J. (1979). Scours in young calves. *Proceedings No. 42, Cattle Diseases, University of Sydney, Post Graduate Committee in Veterinary Science*, p. 243.
- Oddy, V. H. (1978). The Metabolizable Energy system in the feeding of dairy cattle. *Proceedings of Division of Dairying Officers Conference, Hawkesbury Agricultural College, Richmond*.
- O'Halloran, W. J. (1979). Practical management for increased reproduction. *Proceedings of Sheep and Wool Seminar, Wagga Wagga* p. 13.
- Perry, D. A. (1979). State wool production competitions. *Proceedings of Sheep and Wool Seminar, Wagga Wagga* p. 14.
- Phillips, S. W. (1979). Practical breeding plans of merino studs on the slopes and plains. *Proceedings of Sheep and Wool Seminar, Wagga Wagga* p. 4.
- Plant, J. W. (1979). Diagnosis of pig predation as a cause of lamb loss. *Proceedings 55th Annual Conference of Australian Veterinary Association, Sydney, May 1979*, p. 78.
- Plant, J. W. (1979). The importance of predation as a cause of perinatal lamb loss in N.S.W. *N.S.W. Veterinary Proceedings, Sydney* 14: 31.
- Pym, R. A. E. (1978). Optimum feed restriction patterns for broiler breeders during lay. *Proceedings of the 2nd Australasian Poultry and Stock Feed Convention, Sydney* p. 140.
- Pym, R. A. E., Solvyns, A. J. and Nicholls, P. J. (1978). Growth related changes in body composition in broilers. *Proceedings of the 16th World's Poultry Congress, Rio de Janeiro, Brazil* p. 1004.
- Pym, R. A. E. (1978). Selection for food conversion efficiency in broilers. *Proceedings of the 20th British Poultry Breeders Roundtable, Birmingham, England* p. 1.
- Robards, G. E. (1979). Noxious and feral animal research within the N.S.W. Department of Agriculture. *Proceedings of the Animal Conference of the Australian Institute of Agricultural Science, Consultant's Section, University of N.S.W.* p. 131.
- Rogan, I. M. with Bowen, R. W. and Archer, K. A. (1978). High protein potatoes; their breeding and use in animal production. *Proceedings of the XXth International Horticultural Congress, Sydney Abstract* 1782.
- Scarlett, E. C. (1979). Practical management for increased wool growth and body growth. *Proceedings of Sheep and Wool Seminar, Wagga Wagga* p. 11.
- Skillman, G. T. (1978). Quarantine in regard to importation of horses. *Proceedings of 61st Annual Conference of the Association of Veterinary Inspectors of N.S.W.*, Sydney p. 31.
- Smeal, M. (1978). Management programmes for worm control in beef cattle. *Proceedings of 61st Annual Conference of the Association of Veterinary Inspectors of N.S.W.*, Sydney p. 35.
- Watts, J. E. (1979). Breech strike in scouring sheep. *Proceedings of the National Symposium on Sheep Blowfly and Flystrike in Sheep, Sydney* p. 175.
- Wilkins, J. F. and Kilgour, R. J. (1978). Early reproductive performance in female progeny of rams selected on serving capacity. *Proceedings of the Australian Society for Reproductive Biology* 10: 22.
- Williams, J. D. (1978). Balanitis and vulvo-vaginitis in sheep in the Hay district. *N.S.W. Veterinary Proceedings, Sydney* 14: 21.
- Wilson, B. R. (1979). Developments with carcase classification. *Proceedings of Sheep and Wool Seminar, Wagga Wagga* p. 11.

Post-graduate Theses

- Bayfield, R. F. (1979). *Aspects of the dietary control of vitamin A and vitamin E nutrition in sheep*. Masters thesis, University of New South Wales.
- Cohen, R. D. H. (1978). *The nutrition and production of beef cattle in a sub-tropical environment*. Ph.D. Thesis, University of New England, Armidale.
- Hall, C. A. (1978). *Correlation of fleece moisture to the incidence of cutaneous myiasis*. Fellowship thesis, Royal College of Veterinary Surgeons, London.

Books

- Batterham, E. S. (1979). Amino acid availability in pig diets with special reference to natural proteins and synthetic amino acids. In Haresign and Lewis, eds, *Recent Advances in Animal Nutrition—1978* (Butterworths, London).
- McBarron, E. J. (1978). *Poisonous Plants of Western N.S.W.* (Department of Agriculture, Sydney).

Other Publications

- Barnett, C. W. (1979). Advantages of tallow in creep/weaner diets. *Pig Industry Gazette* 2 (2): 24.
- Bolla, G. K. (1978). Heat transmission of roofing materials evaluated. *C.C.A.R.E.C. Rural Newsletter* 68: 36.
- Bolla, G. K. (1978). Paint your silos white. *C.C.A.R.E.C. Rural Newsletter* 69: 13.
- Bolla, G. K. (1978). You and the Chicken Meat Industry Act, 1977. *C.C.A.R.E.C. Rural Newsletter* 67: 44.
- Bolla, G. K. (1979). What Queensland farmers do to avoid heat wave losses. *C.C.A.R.E.C. Rural Newsletter* 70: 23.
- Greer, E. B. (1978). Copper for pigs could mean brass for producers. *The Pig Farmer* 12: 579.
- Greer, E. B. (1978). Cautions with copper in pig diets. *The Pig Farmer* 12: 649.
- Greer, E. B. (1978). A salty story: Salt needs in pig diets. *The Pig Farmer* 13: 93.
- Greer, E. B. (1979). Summer infertility: is vitamin C the answer? *Pig Industry Gazette* 2 (2): 13.
- Greer, E. B., Kirsop, B., and Wright, G. (1979). Is vitamin C during summer any good for sows and boars. *Rural Notes* No. 22 p. 8.
- Greer, E. B. (1979). Summer infertility and vitamin C—Central West pig production research team. *Occasional Report* No. 1.
- Greer, E. B. (1979). Feeding methods survey—Central West pig production research team. *Occasional Report* No. 2.
- Hassab, P. R. (1978). Feed triticale to 55 kg then switch to wheat. *Pig Industry Gazette* 1 (6): 18.
- Hassab, P. R. (1979). Lupins make excellent pig feed. *The Pig Farmer* 13 (6): 28.
- Hone, J. (1978). Introduction and spread of the common myna in New South Wales. *Emu* 78: 227.
- Horn, R. G. (1979). Lighting of growing and laying stock. *The Poultry Farmer* 46: 43.
- Horn, R. G. (1979). Lighting of growing and laying stock. *The Poultry Farmer* 46: 43.
- Horn, R. G. (1979). Poultry officers report on New Zealand visit. *Feeds Review* 1: 4.
- Horn, R. G. (1979). The pay off from farm records. *The New Zealand Poultry World* 43: 3.
- Littleton, I. I. (1978). Homemixers face higher feed costs. *The Poultry Farmer* October 28.

- Mort, P. C. (1979). Lupins make a valuable protein supplement for pigs. *The Pig Farmer* **13** (6): 34.
 Tandy, C. R. (1978). Oats for pigs. *Pig Industry Gazette* **1** (10): 14.
 Tandy, C. R. (1978). Tail biting. *The Pig Farmer* **13** (4): 35.
 Wright, G. L. (1978). Mange problem advice. *Pig Industry Gazette* **1** (6): 21.

BIOMETRICAL BRANCH

Contributions to Journals

- Gleeson, A. C. and McGilchrist, C. A. (University of N.S.W.) (1978). An introduction to relationship algebras. *Communications in Statistics* **A7** (11): 1053.
 Gleeson, A. C. and McGilchrist, C. A. (University of N.S.W.) (1978). Analysis of plant competition data from an incomplete mixed diallel experiment. *Journal of Agricultural Science* (Cambridge University Press) **91**: 419.

Post-graduate Thesis

- Gleeson, A. C. (1978). The statistical analysis of plant competition experiments, Ph.D. thesis, University of New South Wales.

BIOLOGICAL AND CHEMICAL RESEARCH INSTITUTE

BIOLOGY BRANCH

New South Wales Department of Agriculture Publications

- Anon. (1978). Turf diseases. *Biology Branch Bulletin* **PD 73**.
 Anon. (1979). Registered seed treatments for use on winter cereals. *Department of Agriculture Information Bulletin*.
 Ballantyne, B., Letham, D. B. and Conroy, R. J. (1978). Bibliography of Australian vegetable disease research. *N.S.W. Department of Agriculture*.
 Biology Branch Staff (1978). Notes on plant diseases. *N.S.W. Department of Agriculture Biology Branch Plant Disease Survey 1976-77* p. 36.
 Evans, G. (1979). Biology Branch—report on research, *Biological and Chemical Research Institute, Research Report 1976-78* p. 7.
 Kuiper, J. and Murray, G. M. (1978). Spoilage of grain by fungi. *Agricultural Gazette of N.S.W.* **89** (5): 39.
 Luig, N. H. (University of Sydney) (1978). Rust survey 1976-77. *N.S.W. Department of Agriculture Biology Branch Plant Disease Survey 1976-77* p. 10.
 McLeod, R. W. (1978). A survey of plant parasitic nematodes in vineyards in the Murrumbidgee Irrigation Areas. *N.S.W. Department of Agriculture Biology Branch Plant Disease Survey 1976-77* p. 26.
 Malcolm, H. D. R. (1978). Plant growth regulation. *Biology Branch Bulletin* **S15**.
 Malcolm, H. D. R. and Trochoulis, T. (1979). Proteoid roots help macadamia nut trees. *Agricultural Gazette of N.S.W.* **90** (1): 42.
 Nair, N. G. (1979). Mushroom diseases in Australia. *Agricultural Gazette of N.S.W.* **90** (2): 14.
 Penrose, L. J. (1978). Leaf curl of stone fruits. *Biology Branch Bulletin* **PD15**.
 Penrose, L. J. (1978). Crown gall of stone fruits and other plants. *Biology Branch Bulletin* **PD17**.
 Penrose, L. J. (1978). Black heart of apricots. *Biology Branch Bulletin* **PD 142**.
 Penrose, L. J. (1978). Distribution of *Sclerotinia laxa* in N.S.W. *N.S.W. Department of Agriculture Biology Branch Plant Disease Survey 1976-77* p. 31.
 Penrose, L. J. (1979). Crown gall of stone fruits and other plants. *N.S.W. Department of Agriculture Fruit and Vegetable Newsletter* **1** (4): 7.
 Penrose, L. J., Bertus, A. L., Stovold, G. E. and Letham, D. B. (1979). Plant disease advisory service. *Agricultural Gazette of N.S.W.* **90** (3): 40.
 Stovold, G. E. (1978). Diseases of sorghum and broom millet. *Biology Branch Bulletin* **PD 78**.
 Stovold, G. E. (1978). The incidence of *Alternaria carthami* on safflower seed in N.S.W. and its relation to crop production methods. *N.S.W. Department of Agriculture Biology Branch Plant Disease Survey 1976-77* p. 21.
 Thompson, J. A. (1978). Inoculating legumes with root nodule bacteria. *Agricultural Gazette of N.S.W.* **89** (4): 42.
 Walker, J. (1978). Aerial stage of mint rust in N.S.W. *N.S.W. Department of Agriculture Biology Branch Plant Disease Survey 1976-77* p. 34.
 Wellings, C. R. (1978). Brown spot of mandarins. *Biology Branch Bulletin* **PD 10**.
 Wellings, C. R. (1978). Greasy spot of citrus in N.S.W. *Agricultural Gazette of N.S.W.* **89** (6): 40.
 Wellings, C. R. and Nuzum, C. E. (1978). Curvularia stem rot of citrus. *N.S.W. Department of Agriculture Biology Branch Plant Disease Survey 1976-77* p. 23.

Contributions to Journals

- Allen, R. N. (1978). Spread of bunchy top disease in established banana plantations. *Australian Journal of Agricultural Research* **29** (6): 1223.
 Allen, R. N. with Dale, J. L. (Queensland Department of Primary Industries) (1979). Avocado affected by sunblotch disease contains low molecular weight ribonucleic acid. *Australian Plant Pathology* **8** (1): 3.
 Bertus, A. L. and Wood, J. E. (1978). Preventive treatments with two soil fungicides to control root rot caused by *Phytophthora cinnamomi* Rands. *Phytopathologische Zeitschrift* **92**: 266.
 Cother, E. J. (1979). Observations on *Rhizoctonia* disease expression in sandhill potatoes and the effect of temperature on fungal growth rate. *Australasian Plant Pathology* **8** (2): 14.
 Cother, E. J. (1979). Presence of *Rhizoctonia solani* in native *Callitris* pine soils and its implications for future potato growing. *Australasian Plant Pathology* **8** (2): 15.
 Fahy, P. C. with Trimboli, D. (Private Industry) and Baker, K. F. (University of Oregon) (1978). Apical chlorosis and leaf spot of *Tagetes* spp. caused by *Pseudomonas tagetis* Hellmers. *Australian Journal of Agricultural Research* **29**: 831.
 Herridge, D. F. with Pate, J. S. (University of Western Australia) (1978). Partitioning and utilization of net photosynthate in a nodulated grain legume. *Journal of Experimental Botany* **29**: 401.

- Herridge, D. F. with Atkins, C. A., Pate, J. S. and Rainbird, R. M. (University of Western Australia) (1978). Allantoin and allantoic acid in the N economy of cowpea (*Vigna unguiculata* L. Walp.). *Plant Physiology* 62: 495.
- Kable, P. F. with Fried, P. M. and McKenzie, D. R. (Pennsylvania State University) (1978). Spread of powdery mildew from roses to stone fruits. *Proceedings American Phytopathological Society* 4: 113.
- Koffman, W., Penrose, L. J., Menzies, A. R., Davis, K. C. and Kaldor, J. (1978). Control of benzimidazole tolerant *Penicillium expansum*. *Scientia Horticulturae* 9: 31.
- McLeod, R. W. with Khair, G. T. (Commonwealth Department of Health) (1978). Nematodes associated with imported peat moss. *Australasian Plant Pathology* 7 (3) : 32.
- Murray, G. M. (1978). Distribution of *Septoria* species on wheat in N.S.W. *Australasian Plant Pathology* 7 (4) : 44.
- Nair, N. G. (1978). Use of spent compost as casing. *Der Champignon* 199 : 24.
- Nicholls, M. R. (1978). A template for establishing small-plot field trials. *Australasian Plant Pathology* 7 (4) : 1.
- Penrose, L. J. and Davis, K. C. (1978). *Penicillium varrucosum* Dierckx, a cause of blue mould of stone fruit in N.S.W. *Australian Plant Pathology Society Newsletter* 7: 1: 5.
- Penrose, L. J., Davis, K. C. and Koffman, W. (1979). The distribution of benomyl tolerant *Sclerotinia fructicola* (Wint.) Rehm in stone fruit orchards in N.S.W. and comparative studies with susceptible isolates. *Australian Journal of Agricultural Research* 30 (2): 307.
- Roughley, R. J. with Day, J. M., Eaglesham, A. R. J., Dye, M. and White, S. P. (Rothamsted Experiment Station) (1977). Effect of high soil temperatures on nodulation of cowpeas *Vigna unguiculata*. *Proceedings, Association Applied Biologists* 89: 476.
- Stovold, G. E. and Carratt, D. E. (1978). Occurrence of *Phytophthora megasperma* in alfalfa growing soils in N.S.W. *Plant Disease Reporter* 62: 742.
- Walker, J. (1978). The case for *Uromyces trifolii*. *Mycotaxon* 7: 423.
- Walker, J. (1978). Rust of weeping willow in Australia. *Australasian Plant Pathology* 7 (3): 34.
- Walker, J. with Edwards, D. W. (Forestry Commission of N.S.W.) (1978). *Dothistroma* needle blight in Australia. *Australian Forest Research* 8: 125.
- Wearing, A. H. with Burgess, L. W. (University of Sydney) (1978). Distribution and mode of survival of *Fusarium roseum* "graminearum" Group 2 in maize soils in eastern Australia. *Transactions of the British Mycological Society* 70: 480.

Contributions to Technical Conferences

- Allen, R. N. with Young, B. R., Allen, S. and Newhook, F. J. (University of Auckland) (1978). Zoospore motility of *Phytophthora cinnamomi* in particulate substrates. *Abstracts 3rd International Congress of Plant Pathology*, Munich p. 91.
- Ballantyne, B. J. (1978). Breeding for disease resistance. *3rd National Plant Pathology Conference*, Melbourne working Paper.
- Ballantyne, B., Letham, D. B. and Conroy, R. J. (1978). Crop protection in vegetable production. *XXth International Horticultural Congress*, Sydney Abstract 1819.
- Broadbent, P. (1978). Biological control of *Phytophthora* root rot in avocados. *Proceedings, National Seminar on Biological Control*, Hobart, 1977.
- Broadbent, P. (1978). Influence of biotic factors on *Phytophthora* species and on disease. *Phytophthora Workshop*, Melbourne.
- Broadbent, P., Fraser, L. R. and Fry, R. (1978). Disorders of Ellendale tangor and Hickson mandarin. *XXth International Horticultural Congress*, Sydney Abstract 1310.
- Broadbent, P., Bevington, K., Fraser, L. R. and Freeman, B. (1979). *Citrus macrophylla* behaviour as a rootstock in trials in N.S.W. *8th Conference, International Organisation of Citrus Virologists*, Sydney Abstract 13.
- Broadbent, P. and Fraser, L. R. (1979). Within block variation in psorosis symptom expression. *8th Conference, International Organisation of Citrus Virologists*, Sydney Abstract 40a.
- Broadbent, P., Fraser, L. R. & Briggs, B. with officers of the Division of Horticulture (1979). Summaries of trials and field inspections. *8th Conference, International Organisation of Citrus Virologists*, Sydney Abstract p. 13.
- Cother, E. J. (1979). Bacterial seed-piece decay in irrigated sandy soils. *Australian Potato Research Conference*, Cowes, 4: 8.
- Cother, E. J. (1979). Isolation of *Rhizoctonia solani* from native *Callistris* pine forests using potato seedlings, and the implications for future potato growing. *Australian Potato Research Conference*, Cowes Abstracts 4: 10.
- Cother, E. J. (1979). *Rhizoctonia* disease expression in irrigated sandy soil. *Australian Potato Research Conference*, Cowes abstracts 4: 11.
- Fahy, P. C. (1978). Bacterial blight of cotton. *Cotton Seminar*, Wee Waa 14th September.
- Fraser, L. R. (1978). Recognition and control of citrus virus diseases. *XXth International Horticultural Congress*, Sydney Abstract 1320.
- Fraser, L. R. and Broadbent, P. (1978). Strains of exocortis and gummy pitting: symptoms in *Poncirus trifoliata* and *Citrus* spp. *XXth International Horticultural Congress*, Sydney Abstract 1311.
- Fraser, L. R. and Broadbent, P. (1979). Variations in the exocortis-gummy pitting complex. *8th Conference, International Organisation of Citrus Virologists* Abstract 49.
- Herridge, D. F. (1979). Carbon and nitrogen nutrition of nodulated legumes. *Chinese-Australian Symposium on Biological Nitrogen Fixation*, Beijing.
- Hutton, R. J. and Kable, P. F. (1978). Post harvest dips for rot control in mechanically harvested fruit. *XXth International Horticultural Congress*, Sydney Abstract 1110.
- Koffman, W., Kable, P. F. and Kaldor, J. (1978). Post harvest fungicides for the control of brown rot and transit rot in stone fruits. *XXth International Horticultural Congress*, Sydney Abstract 1168.
- Koffman, W., Penrose, L. J. and Kaldor, J. (1978). Alternative fungicides for post harvest control of benzimidazole tolerant *Sclerotinia fructicola*. *XXth International Horticultural Congress*, Sydney Abstracts 1109.
- Koffman, W., Penrose, L. J., Menzies, A. R., Davis, K. C. and Kaldor, J. (1978). Studies on benzimidazole tolerant blue mould (*Penicillium expansum*). *XXth International Horticultural Congress*, Sydney Abstract 1170.
- Kuiper, J. (1978). Impact of *Mycosphaerella graminicola* on wheat production in southern N.S.W. *Proceedings, Australian Septoria Workshop*, Wagga Wagga p. 9.
- Kuiper, J. (1978). Assessment of losses in wheat caused by *Septoria tritici* in N.S.W. *Proceedings Australian Plant Pathology Society Workshop, "Epidemiology and Crop Loss Assessment"*, Dunedin, New Zealand (1977): 14 (1).
- Malcolm, H. D. R. (1978). A host-specific toxin extracted from *Septoria tritici*. *Proceedings, Australian Septoria Workshop*, Wagga Wagga p. 30.
- Malcolm, H. D. R. and Trochoulas, T. (1978). Propagation and establishment of macadamia nut trees. *XXth International Horticultural Congress*, Sydney Abstract 1648.

- Moore, K. J. with Cook, R. J. (Washington State University) (1978). Influence of no-tillage on take-all of wheat. *3rd International Congress of Plant Pathology*, Munich Abstracts p. 175.
- Murray, G. M. (1978). Distribution of Septoria pathogens of wheat in N.S.W. *Proceedings, Australian Septoria Workshop*, Wagga Wagga p. 2.
- Murray, G. M. (1978). Identification of pathogens necessary in disease nurseries. *Proceedings, Australian Septoria Workshop*, Wagga Wagga p. 37.
- Murray, G. M. (1978). AUSEN Methodology. *Proceedings, Australian Septoria Workshop*, Wagga Wagga p. 41.
- Murray, G. M. and Martin, R. H. (1978). Twenty nine years of Septoria at Temora. *Proceedings, Australian Septoria Workshop*, Wagga Wagga p. 16.
- Nair, N. G. (1978). The mushroom industry in Australia. *XXth International Horticultural Congress*, Sydney Abstract 1768.
- Nair, N. G. (1978). Some characteristics of peat moss and their relevance in mushroom cultivation. *Proceedings 5th National Mushroom Industry Conference*, Adelaide p. 9.
- Nair, N. G. (1978). Controlled environment mushroom rooms. *Proceedings, 5th National Mushroom Industry Conference*, Adelaide p. 1.
- Penrose, L. J. and Koffman, W. (1978). Studies on benzimidazole tolerant *Sclerotinia fructicola*. *XXth International Horticultural Congress*, Sydney Abstract 1169.
- Trochoulis, T. and Broadbent, P. (1978). Comparison of soil management regimes for avocados. *XXth International Horticultural Congress*, Sydney Abstract 1600.
- Weir, R. G., Letham, D. B., Broadbent, P. and Nicholls, P. J. (1978). The effects of phosphorous and vesicular-arbuscular mycorrhizal infections on establishment and growth of rough lemon seedlings on a problem Sandmount series soil. *XXth International Horticultural Congress*, Sydney Abstract 1341.
- Wellings, C. R. with Wade, N. L. (CSIRO) and Morris, S. C. (1978). Post harvest diseases of rockmelon fruits. *XXth International Horticultural Congress*, Sydney Abstract 1111.
- Wellings, C. R. with Emmett, R. W. (Department of Agriculture, Victoria) (1978). Greasy spot of citrus. *XXth International Horticultural Congress*, Sydney Abstract 1306.
- Wong, P. T. W. and Southwell, R. J. (1978). Biological control of wheat take-all in the field using *Gaeumannomyces graminis* var *graminis* and related fungi. *3rd International Congress of Plant Pathology*, Munich Abstracts p. 184.

Books

- Fahy, P. C. (1978). Tracing populations of plant stimulatory *Bacillus* spp. in alien environments. Pp. 303-306 in M. W. Loutit and J. A. R. Miles, eds., *Microbial Ecology*. (Springer-Verlag, New York).
- Fraser, L. R. and Broadbent, P. (1979). *Virus and related diseases of citrus in New South Wales*. (Surrey Beatty and Sons Ltd, Chipping Norton).
- Herridge, D. F. with Atkins, C. A. and Pate, J. S. (University of Western Australia) (1977). The economy of carbon and nitrogen in nitrogen-fixing annual legumes—experimental observations and theoretical considerations. Pp. 211-242 In *Isotopes in Biological Dinitrogen Fixation*. (International Atomic Energy Agency, Vienna).
- Johnson, J. F., Penrose, L. J. and Thwaite, W. G. (1978). *Deciduous Fruits Spray Calendar, Tablelands, Slopes and Coastal Highlands of N.S.W.*, 1978-79. No. 18 (Ambassador Press Pty Ltd, Granville).
- Kable, P. F. (1978). Practical management of crop diseases. *Report on Overseas Study Tour prepared for the Winston Churchill Memorial Trust*.
- Smith, A. M., Milham, P. J. and Morrison, W. L. (1978). Soil ethylene production specifically triggered by ferrous ion. Pp. 329-336 in M. W. Loutit and J. A. R. Miles, eds., *Microbial Ecology*. (Springer-Verlag, New York).

Other Publications

- Allen, R. N. (1978). A proposed avocado planting material approval scheme. *N.S.W. Avocado Growers Association Newsletter* 1.
- Allen, R. N. (1978). The N.S.W. avocado register. *N.S.W. Avocado Growers Association Newsletter* 1.
- Evans, G. (1978). Research into Verticillium wilt of cotton. *Armidale Liaison Notes* 29: 1/79.
- Fitzell, R. D. (1978). Anthracnose; a growing problem. *Banana Bulletin* 42: 7.
- Fitzell, R. D. (1979). Papaw dipping controls ripe rots. *Banana Bulletin* 42 (4): 16.
- Herridge, D. F. (1979). Nitrogen fixation in soybeans. *Armidale Liaison Notes* 30: 47/79.
- Kable, P. F. (1979). Spray in winter to prevent losses from new brown rot. *I.R.E.C. Farmers Newsletter* 143: 2.
- Kuiper, J. (1978). Control of smuts in winter cereals. *Hard and Soft Newsletter* November, 1978: 4.
- Letham, D. B. with Dephoff, C. (Private Industry) (1978). Effect of disinfectants on the viability of spores and mycelium of *Agaricus bisporus*. *Australian Mushroom Growers Annual* 1: 49.
- McLeod, R. W. and Nair, N. G. (1978). Effect of non-parasitic nematodes on yield of cultivated mushrooms. *Australian Mushroom Growers Association Newsletter* 3: 2.
- McLeod, R. W. (1979). Where do nematodes go in winter? *Australian Tobacco Growers Bulletin* 26: 2.
- Nair, N. G. (1978). A report on mushroom work. *Australian Mushroom Growers Annual* 1: 20.
- Nair, N. G. (1978). A new type of virus-like particle associated with a disease of the cultivated mushroom. *Australian Mushroom Growers Annual* 1: 34.
- Nair, N. G. and Baker, H. J. (1978). A note on after crop sterilisation of mushroom trays with sodium pentachlorophenate. *Australian Mushroom Growers Annual* 1: 48.
- Nikandrow, A. with Ikin, R. (Commonwealth Department of Health) and Smith, P. R. (Department of Agriculture, Victoria) (1979). Report on procedures for screening viruses in imported ornamental vegetative material. *Prepared for Standing Committee on Agriculture Plant Pathology Committee*.
- Nikandrow, A. and Walker, J. with Amor, R. (Keith Turnbull Research Institute), Haseler, W. (The Sir Alan Fletcher Research Station), Groves, R. and Cullen, J. (CSIRO), Jenkins, P. (Department of Agriculture, Victoria) and Navaratnam, S. (Commonwealth Department of Health) (1978). Report of the working party on the importation of fungal pathogens for the biological control of weeds. *Prepared for Standing Committee on Agriculture Plant Pathology Committee*.
- Thompson, J. A. (1979). Inoculation of soybeans with root nodule bacteria. *Armidale Liaison Notes* 30: 46/79.
- Walker, J. (1978). Rusts and smuts reported on *Myrtaceae* with special reference to Australian quarantine. *Prepared for the Commonwealth Department of Health*.

CHEMISTRY BRANCH

Contributions to Journals

- Awad, A. S., Edwards, D. G. (University of Queensland) and Huett, D. O. (1979). Seasonal changes in chemical composition of heavily fertilized kikuyu pasture and their potential effects on the mineral nutrition of grazing cattle. *Australian Journal of Experimental Agriculture and Animal Husbandry* 19: 183.

- Batten, G. D. (1978). Some factors affecting the extraction of soil "available" phosphate. *Australian Journal of Soil Research* 16: 355.
- Batten, G. D., Blair, G. J. (University of New England) and Lill, W. J. (1979). Changes in soil phosphorus and pH in a red earth soil during build-up and residual phases of a wheat-clover ley farming system. *Australian Journal of Soil Research* 17: 163.
- Holford, I. C. R. (1978). Soil absorption phenomena and the Langmuir equation. *Soil Science Society of America Journal* 42: 986.
- Holford, I. C. R. and Patrick, W. H. Jr. (Louisiana State University) (1979). Effects of reduction and pH changes on phosphate sorption and movility in an acid soil. *Soil Science Society of America Journal* 43: 292.
- Leece, D. R. (1978). Foliar absorption in *Prunus domestica* L. 1. Nature and development of the surface wax barrier. *Australian Journal of Plant Physiology* 5: 749.
- Lewis, C. E. (1978). The maturity of avocados—a general review. *Journal of the Science of Food and Agriculture* 29: 857.
- Lewis, C. E., Morris, R. and O'Brien, K. (1978). The oil content of avocado mesocarp. *Journal of the Science of Food and Agriculture* 29: 943.
- McCleary, B. V. (1978). A simple assay procedure for β -D-mannanase. *Carbohydrate Research* 67: 213.
- McCleary, B. V. (1979). Enzymic hydrolysis, fine structures and gelling interaction of legume-seed D-galacto-D-mannans. *Carbohydrate Research* 71: 205.
- McCleary, B. V. (1979). Modes of action of β -mannanase enzymes of diverse origin on legume seed galactomannans. *Phytochemistry* 18: 757.
- Singh, G., Rigney, C. J. and Gilbert, W. S. (1979). Ethylene dibromide and inorganic bromide residues in oranges after fumigation and storage. *Australian Journal of Experimental Agriculture and Animal Husbandry* 19: 377.

Contributions to Technical Conferences

- Abbott, T. S. and Sinclair, P. J. (1979). Effects of several furrow treatments on the absorption of water into beds of structurally unstable soil. *Australian Society of Soil Science, Riverina Branch Conference*, Yanco p. 124.
- Bacon, P. E. (1978). Some effects of rootstock and planting density on the performance of dwarf valencia orange trees. *XXth International Horticultural Congress*, Sydney, Abstract 1353.
- Bacon, P. E. and Bevington, K. B. (1978). Effect of time of hedging on shoot growth and flowering in citrus. *XXth International Horticultural Congress*, Sydney, Abstract 1350.
- Bacon, P. E. and Bevington, K. B. (1978). A spacing experiment with dwarf and non-dwarf citrus trees. *XXth International Horticultural Congress*, Sydney, Abstract 1355.
- Bacon, P. E. (1979). Early nitrogen applications to rice. *Australian Rice Workshop*, Yanco p. C30.
- Bacon, P. E. (1979). Mid-season topdressing of rice. *Australian Rice Workshop*, Yanco p. C34.
- Bacon, P. E. (1979). Efficiency of different calcium application methods in controlling muddy water. *Australian Society of Soil Science, Riverina Branch Conference*, Yanco p. 116.
- Bacon, P. E., and Cooper, J. L. (1979). Rice stubble management. *Australian Rice Workshop*, Yanco p. C37.
- Barnes, W. C. (1978). The rapid determination of starch damage in wheat breeding programs. *6th International Cereal and Bread Congress*, Winnipeg, Abstract A3-5.
- Barnes, W. C. (1978). Selection for starch damage in wheat breeding programmes. *28th Annual Conference of the Royal Australian Chemical Institute, Cereal Chemistry Division*, Sydney, Abstract 18.
- Bird, E. T., Simon, G. (Liverpool Technical College), Jacob, E. H. and Almgren, G. (1978). Durum flour—a successfully developed by-product. *28th Annual Conference of the Royal Australian Chemical Institute, Cereal Chemistry Division*, Sydney, Abstract 38.
- Blakeney, A. B. (1978). Grain breakage in rice. *6th International Cereal and Bread Congress*, Winnipeg, Abstract C5-5.
- Blakeney, A. B. (1978). Cereal phytases. *28th Annual Conference of the Royal Australian Chemical Institute, Cereal Chemistry Division*, Sydney, Abstract 4.
- Blakeney, A. B. (1978). Colorimetric thio-barbituric acid method for fructose. *28th Annual Meeting of the Royal Australian Chemical Institute, Cereal Chemistry Division*, Sydney, Abstract 41.
- Blakeney, A. B. and Bowen, R. (1978). A colorimetric method for determining potato reducing sugars. *XXth International Horticultural Congress*, Sydney, Abstract 1099.
- Blakeney, A. B. and Jacob, E. H. (1978). Rapid field test for detecting high tannin sorghums. *Proceedings of the 28th Annual Conference of the Royal Australian Chemical Institute, Cereal Chemistry Division*, Sydney p. 83.
- Blakeney, A. B. (1979). Sources of error in nitrogen uptake determinations. *Australian Rice Workshop*, Yanco p. C18.
- Blakeney, A. B. (1979). Quality of N.S.W. rice. *Australian Rice Workshop*, Yanco p. D1.
- Blakeney, A. B. (1979). Influence of protein on rice whole grain milling yield. *Australian Rice Workshop*, Yanco p. D21.
- Blakeney, A. B. (1979). Measuring cooked rice texture. *Australian Rice Workshop*, Yanco p. D22.
- Blakeney, A. B. (1979). Grain breakage. *Australian Rice Workshop*, Yanco p. D35.
- Blakeney, A. B. with du Cros, D. L. and Wrigley, C. W. (CSIRO Wheat Research Unit) (1979). Identification of rice cultivars by protein electrophoresis. *Australian Rice Workshop*, Yanco p. D32.
- Cradock, F. W. (1979). Past research on acid soil and lime for pastures in N.S.W. *Workshop on Acid Soils*, Rydalmere p. 60.
- Glennie-Homes, M. and Davey, K. H. (1978). Measurement of bread texture using the Instron 1140 Tester. *Proceedings of the 28th Annual Conference of the Royal Australian Chemical Institute, Cereal Chemistry Division*, Sydney p. 59.
- Holford, I. C. R. and Patrick, W. H. Jr (1978). Effects of redox potential and pH on phosphate removal from wastewater during land application. *Proceedings of the International Conference on Developments in Land Methods of Wastewater Treatment and Utilization*, Melbourne p. 16/1.
- Hudson, A. W. and Hawkins, C. A. (1979). Soil acidity in N.S.W., the extent and severity of the problem. *Workshop on Acid Soils*, Rydalmere p. 7.
- Leece, D. R., Craighead, M. D. and Dirou, J. F. (1978). Foliar absorption: enhancement by organosilicone and fluorocarbon surfactants. *XXth International Horticultural Congress*, Sydney, Abstract 1524.
- Leece, D. R. and Craighead, M. D. (1979). Leaf wetting and stomatal infiltration. *20th General Meeting, Australian Society of Plant Physiologists*, Canberra, Abstracts, p. 45.
- McCleary, B. V. (1979). Hydrolysis of legume seed galactomannans by α -D-galactosidase and β -D-mannanase enzymes. *176th National Meeting, American Chemical Society*, Florida, Abstracts p. 70.
- McCleary, B. V. with Marshall, J. J. (1978). Glucoamylase enzymes produced by *Cladosporium resinae*. *Japanese Biochemical Society Meeting*, Kyoto.
- McCleary, B. V. (1979). Fine structures and gelling interaction of legume seed galactomannans, *177th National Meeting, American Chemical Society*, Honolulu, Abstract 41.

- Milham, P. J., Kaldor, C. J., Hudson, A. W. and Maguire, M. J. (1978). Soluble aluminium and pH relations in acid soils. *Proceedings of the 8th International Colloquium on Plant Analysis and Fertilizer Problems*, Auckland p. 355.
- Milham, P. J., Nicholls, P. and Barkus, B. (1978). Laboratory errors in plant tissue analysis. *Proceedings of the 8th International Colloquium on Plant Analysis and Fertilizer Problems*, Auckland p. 357.
- Read, R. H. (1978). Field irrigation and infiltration equations. *Irrigated Soils Workshop*, Narrabri p. 28.
- Read, R. H. and Collis-George, N. (1979). Analysis of field infiltration and the application of some infiltration results to (i) border check irrigation and (ii) amelioration of a sports oval. *Conference on Soil Physics and Field Heterogeneity*, Canberra p. 136.
- Saini, H. S. (1979). Galactosyl-sucrose oligosaccharides and α (1-4) (1-6) glucan of chickpeas (*Cicer arietinum*). *23rd Annual Meeting Australian Biochemical Society*, Canberra, Abstracts p. 65.
- Short, C. C., Milham, P. J., Maguire, M. J. and Hudson, A. (1978). The interference by ion on the fluorescence of tris (8-quinolinolate) aluminium. *11th Australian Spectroscopy Conference*, St Lucia Handbook, p. 112.
- Vimpany, I. A. (1979). Soil acidity—detection, measurement and causes—use of lime. *Workshop on Acid Soils*, Rydalmere p. 65.
- Weir, R. G., Bevington, K. B. and Duncan, J. H. (1978). The effect of phosphorus on fruit quality, leaf analysis and yield of Valencia oranges. *XXth International Horticultural Congress*, Sydney Abstract 1340.
- Weir, R. G., Letham, D., Broadbent, P. and Nicholls, P. J. (1978). The effect of phosphorus and vesicular-arbuscular mycorrhizal infection on establishment and growth of rough lemon seedlings on a problem sandmount series soil. *XXth International Horticultural Congress*, Sydney, Abstract 1341.
- Weir, R. G. and Milham, P. J. (1978). Use of plant analysis to assess zinc status of maize seedlings. *Proceedings of the 8th International Colloquium on Plant Analysis and Fertilizer Problems*, Auckland, p. 54.
- Weir, R. G. (1979). Diagnosis of aluminium and manganese toxicities and calcium, magnesium and molybdenum deficiencies in pastures and crops in the field and the laboratory. *Workshop on Acid Soils*, Rydalmere p. 73.
- Weir, R. G. (1979). The plant's nutrient requirements. *Seminar on Commercial Applications of Hydroponics*, Burnley Horticultural College p. 2-1 (Department of Agriculture, Victoria, Agricultural Note Series No. 12,

Other Publications

- Bacon, P. E. (1979). Rice nitrogen research in the U.S.A. *Ricemill News* **11** (17): 24.
- Blakeney, A. B. (1979). A close look at chalky belly. *Ricemill News* **11** (15): 39.
- McCleary, B. V. (1978). A new procedure for the preparation of soluble chromogenic substrates for the assay of polysaccharide endo-hydrolases. *Australian Provisional Patent No. PD 6910*.

ENTOMOLOGY BRANCH

New South Wales Department of Agriculture Publications

- Casimir, M. (1979). Entomology Branch. *Biological and Chemical Research Institute Report 1976-1978* p. 59.
- Goodyer, G. J. (1978). The identification of armyworm, cutworm, budworm and looper caterpillar pests. *AG Bulletin* **2**.
- Goodyer, G. J. (1979). Slaters and pillbugs. *Insect Pest Bulletin* **114**.
- Greening, H. G. (1978). Controlling grain insects on farms. *Agricultural Gazette of N.S.W.* **89** (5): 18.
- Hamilton, J. T. and Attia, F. I. (1979). Problems developing in control of green peach aphids. *Agricultural Gazette of N.S.W.* **90** (1): 6.
- Hughes, P. B. and Shanahan, G. J. (1978). Assessing OP insecticide resistance in sheep blowflies. *Agricultural Gazette of N.S.W.* **89** (6): 8.
- Hughes, P. B. and Shanahan, G. J. (1979). The role of chemicals in flystrike control. *Agricultural Gazette of N.S.W.* **90** (3): 9.
- Jones, E. L. (1978). Fruit tree moth borer. Prune research at Young 1973-77. *N.S.W. Department of Agriculture Bulletin* **78**: 32.
- Shanahan, G. J. (1979). Resistance of organisms to control agents. *Veterinary Notes* **13** (1): 4.
- Shanahan, G. J., Hall, C. A. and Hughes, P. B. (1979). Resistance to insecticides. *Veterinary Notes* **13** (1): 12.
- Wallbank, B. E. (1978). Assessing new grain protectants. *Agricultural Gazette of N.S.W.* **89** (6): 38.
- Walters, P. J. (1978). Coming to grips with lucerne aphids. *Agricultural Gazette of N.S.W.* **89** (5): 15.

Contributions to Journals

- Attia, F. I. and Hamilton, J. T. (1978). Insecticide resistance in *Myzus persicae* in Australia. *Journal of Economic Entomology* **71**: 851.
- Attia, F. I., Hamilton, J. T. and Franzmann, B. A. (1979). Carbamate resistance in a field strain of *Myzus persicae* (Sulzer) (Hemiptera: Aphididae). *General and Applied Entomology* **11**: 24.
- Attia, F. I., Shipp, E. and Shanahan, G. J. (1979). Survey of insecticide resistance in *Plodia interpunctella* (Hubner) (Lepidoptera: Pyralidae) in N.S.W. *Journal of the Australian Entomological Society* **18**: 67.
- Attia, F. I., Shipp, E. and Shanahan, G. J. (1979). Selection response of a resistant strain of *Plodia interpunctella* (Hubner) (Lepidoptera: Pyralidae) to malathion. *General and Applied Entomology* **11**: 46.
- Beattie, G. A. C. (1978). Citrus leaf-miner control with systemic insecticides. *Insecticide and Acaricide Tests* **3**: 57.
- Beattie, G. A. C. and McDonald, F. J. D. (1979). The effect of an aziridinyl chemosterilant, *N,N*¹-hexamethylenebis (1-aziridinecarboxamide) on the development of the immature stages of *Lucilia cuprina* (Wied.) (Diptera: Calliphoridae). *General and Applied Entomology* **11**: 13.
- Beattie, G. A. C. and McDonald, F. J. D. (1979). An autosterilization technique for the Australian sheep blowfly, *Lucilia cuprina* (Wied.) (Diptera: Calliphoridae). *General and Applied Entomology* **11**: 27.
- Brown, G. R. (1978). Light trapping of noctuid moths (Lepidoptera: Noctuidae) at Rydalmere, N.S.W. *General and Applied Entomology* **10**: 53.
- Brown, G. R. (1978). *Trichoplusia orichalcea* (Fabricius) (Lepidoptera: Noctuidae) in N.S.W. *General and Applied Entomology* **10**: 44.
- Chadwick, C. E. and Nikitin, M. I. (1979). Insects and other invertebrates intercepted in quarantine in N.S.W. Part 3. New records for the years 1966-1969. *General and Applied Entomology* **11**: 51.

- Clift, A. D. (1979). Activity of chlordimeform hydrochloride and amitraz mixtures with *Bacillus thuringiensis* against *Heliothus armigera* (Hubner) (Lepidoptera: Noctuidae). *General and Applied Entomology* **11**: 21.
- Fletcher, M. J. (1979). Notes on Australian Flatidae (Homoptera: Fulgoroidea) including a new synonymy. *General and Applied Entomology* **11**: 67.
- Fletcher, M. J. (1979). Egg types and oviposition behaviour in some fulgoroid leafhoppers (Homoptera: Fulgoroidea). *Australian Entomological Magazine* **6** (1): 13.
- Goodyer, G. J. (1978). Toxicity of insecticides to the green vegetable bug, *Nezara viridula* L. (Hemiptera: Pentatomidae). *General and Applied Entomology* **10**: 50.
- Goodyer, G. J. (1979). Resistance of the African black beetle, *Heteronychus arator* (F.) (Coleoptera: Scarabaeidae) to organochlorine insecticides. *General and Applied Entomology* **11**: 49.
- Hamilton, J. T. (1979). Seasonal incidence of *Pieris rapae* (L.), *Plutella xylostella* (L.) and their diseases and parasites. *General and Applied Entomology* **11**: 59.
- Hughes, P. B. (1978). Insecticide resistance in field populations of the sheep blowfly *Lucilia cuprina* (Wiedemann) in 1977. *Australian Journal of Experimental Agriculture and Animal Husbandry* **18**: 844.
- Hughes, P. B. and Trevethan, P. (1979). Laboratory and semi-field evaluation of chlōrfenvinphos/cypermethrin mixtures against larvae of the sheep blowfly *Lucilia cuprina* (Wiedemann). *General and Applied Entomology* **11**: 18.
- Nikitin, M. I. (1979). Geographical distribution of three species of small ants common in N.S.W. *Australian Entomological Magazine* **5** (6): 101.
- Schicha, E. (1978). *Typhlodromus nesbitti* Womersley redescribed (Acari: Phytoseiidae). *Australian Entomological Magazine* **5** (1): 5.
- Schicha, E. (1979). Three new species of *Amblyseius* Berlese from New Caledonia and Australia (Acari: Phytoseiidae). *Australian Entomological Magazine* **6** (3): 41.
- Schicha, E. (1979). Two new species of *Amblyseius* Berlese from Australia. *International Journal of Acarology* **5** (3): 50.
- Shanahan, G. J. and Hughes, P. B. (1979). Larval implant studies with *Lucilia cuprina*. *The Veterinary Record* **103**: 582.
- Shanahan, G. J., Hughes, P. B. and Attia, F. I. (1979). Synergism of diazinon against organophosphorus resistant *Lucilia cuprina* (Wiedemann). *General and Applied Entomology* **11**: 57.
- Thwaite, W. G., (1978). Light brown apple moth, *Epiphyas postvittana* (Walker) (Lepidoptera: Tortricidae) flight records for eight seasons at Bathurst, N.S.W. *General and Applied Entomology* **10**: 39.
- Thwaite, W. G. and Kaldor, J. (1978). Control of two-spotted mite in apples. *Insecticide and Acaricide Tests* **3**: 40.

Contributions to Technical Conferences

- Baker, G. L. (1979). The adverse effects of below-average rainfall in parasites of the post-embryonic stages of the wingless grasshopper. *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland. Working papers p. 6-1.
- Baker, G. L. (1979). Regional differences in the parasite complex and plague dynamics of the Australian plague locust (*Chortoicetes terminifera* (Walker)). *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland. Working papers p. 7-1.
- Beattie, G. A. C. (1978). Biological control of citrus mites in coastal N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1297.
- Beattie, G. A. C. and Rippon, L. E. (1978). Phytotoxicity and scalcicide efficacy of citrus spray oils. *XXth International Horticultural Congress*, Sydney Abstract 1299.
- Beattie, G. A. C. (1979). Predators associated with citrus red mite, *Panonychus citri* (McG.) in coastal N.S.W. *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland. Working papers p.7-4.
- Bishop, A. L. (1978). Effect of grazing by dairy cattle on populations of blue-green aphid and spotted alfalfa aphid in lucerne. *Lucerne Aphid Workshop*, Tamworth p. 61.
- Bishop, A. L. and Holtkamp, R. H. (1978). Report on the aphid monitoring block at Singleton (Hunter Valley). *Lucerne Aphid Workshop*, Tamworth, p. 57.
- Bishop, A. L. and Walters, P. J. (1978). Damage levels for blue-green aphids on lucerne varieties Condura 73 and CUF 101. *Lucerne Aphid Workshop*, Tamworth p. 169.
- Bishop, A. L. (1979). The role of spiders as predators in a cotton ecosystem. *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland, Working papers p. 7-6.
- Bower, C. C. (1978). Identity and relative importance of native predatory mites. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 25.
- Bower, C. C. (1979). Testing chemicals in the field for use in integrated mite control programmes with *Typhlodromus occidentalis*. *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland, Working papers p. 9-4.
- Bower, C. C. (1979). Apparent exclusion of native predatory mites from apple trees by an introduced species. *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland. Working papers p. 7-10.
- Clift, A. D. and Toffolon, R. B. (1978). Pest status and control of mushroom mites in Australia. *5th National Mushroom Industry Conference*, Adelaide p. 13.
- Clift, A. D. and Toffolon, R. B. (1978). The correct use of insecticides on Australian mushroom farms. *5th National Mushroom Industry Conference*, Adelaide p. 20.
- Edge, V. E. (1978). Chemical control and resistance—current situation and future possibilities. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 7.
- Forrester, N. W. (1978). Seasonal abundance of spotted alfalfa aphid, blue green aphid and their predators at Tamworth, N.S.W. *Lucerne Aphid Workshop*, Tamworth p. 53.
- Forrester, N. W. (1978). Parasitism and disease incidence in field populations of spotted alfalfa aphid and blue green aphid at Tamworth, N.S.W. *Lucerne Aphid Workshop*, Tamworth p. 80.
- Forrester, N. W., Greenup, L. R., Fletcher, M. J., Bower, C. C., Jones, E. L., Thwaite, W. G., Treverrow, N. and Walters, P. J. (1978). Initial distribution and abundance of lucerne aphids in N.S.W. *Lucerne Aphid Workshop*, Tamworth p. 39.
- Forrester, N. W. (1979). Ecological studies on the natural enemies of sorghum midge, *Contarinia sorghicola* (Coquillett). *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland. Working papers p. 5-6.
- Forrester, N. W. (1979). Seasonal abundance of the introduced egg parasite, *Trissolcus vasalis* (Woll.), on insect pests of grain legumes at Tamworth, N.S.W. *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland. Working papers p. 5-9.
- Forrester, N. W. (1979). Parasitism and disease incidence in field populations of the spotted alfalfa aphid, *Therioaphis trifolii* (Monell) f. *maculata*, and blue green aphid, *Acyrtosiphon kondoi* Shinji. *3rd Australian Applied Entomological Research Conference*, Lawes, Queensland, Working papers p. 5-13.

- Forrester, N. W. (1979). Studies on the natural enemies of *Nysius vinitor* Bergroth, and *Nysius clevelandensis* Evans on sunflowers. 3rd Australian Applied Entomological Research Conference, Lawes, Queensland. Working papers p. 7-13.
- Goodwin, S. (1978). Current status of mites as pests in deciduous orchards and other horticultural crops. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 4.
- Goodwin, S. (1978). Chemical control and resistance—current situation and future possibilities. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 9.
- Goodwin, S. (1978). Progress in integrated control of mites in orchards and other crops: hops, strawberries and grapevines. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 22.
- Goodwin, S. (1978). Extension problems associated with integrated mite control and future prospects. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 31.
- Greening, H. G. (1979). Observations on the occurrence of insects pests of stored grain in N.S.W. Australian contributions to the *Symposium on Protection of Grain against Insect Damage during Storage*, Moscow, 1978 p. 15.
- Greening, H. G. (1979). Chemical control of insects infesting farm-stored grain and harvesting machinery. Australian contributions to the *Symposium on Protection of Grain against Insect Damage during Storage*, Moscow, 1978 p. 74.
- Jones, E. L. (1978). Insecticidal control of lucerne seed wasp. *Lucerne Aphid Workshop*, Tamworth p. 246.
- Jones, E. L. (1979). Persistence and change in status of rice pests in the Riverina. *Australian Rice Workshop*, Yanco p. E6.
- Rand, J. (1978). Insect pests of avocados. *XXth International Horticultural Congress*, Sydney, Abstract 1618.
- Schicha, E. (1978). Identity and relative importance of native predatory mites. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 24.
- Shananhan, G. J. and Hughes, P. B. (1979). The history and significance of insecticide resistance in field populations of the primary sheep blowfly, *Lucilia cuprina*. *National Symposium on the Sheep Blowfly and Flystrike in Sheep*, Sydney p. 69.
- Thwaite, W. G. and Bower, C. C. (1978). Current status of mites as pests in deciduous orchards and other horticultural crops. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 4.
- Thwaite, W. G. and Bower, C. C. (1978). Chemical control and resistance—current situation and future possibilities. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 8.
- Thwaite, W. G. and Bower, C. C. (1978). Progress in integrated control of mites in orchards and other crops: pome and stone fruit. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra, p. 16.
- Thwaite, W. G. and Bower, C. C. (1978). Techniques for rearing, screening and releasing predatory mites. *The Future of Integrated Mite Control in Horticultural Crops Workshops*, Canberra p. 26.
- Thwaite, W. G. and Bower, C. C. (1978). Extension problems associated with integrated mite control and future prospects. *The Future of Integrated Mite Control in Horticultural Crops Workshop*, Canberra p. 30.
- Thwaite, W. G. and Bower, C. C. (1979). The release and monitoring for establishment of an introduced predatory mite in N.S.W. apple orchards. 3rd Australian Applied Entomological Research Conference, Lawes, Queensland, Working papers p. 4-9.
- Treverrow, N. L. and Jones, E. L. (1978). Lucerne aphid monitoring at Griffith, N.S.W. *Lucerne Aphid Workshop*, Tamworth p. 59.
- Treverrow, N. L. (1979). Resistance of rice varieties to attack by bloodworms. *Australian Rice Workshop*, Yanco p. E1.
- Walters, P. J. and Bishop, A. L. (1978). Effects of overhead sprinkler irrigation on numbers of and disease incidence in BGA populations. *Lucerne Aphid Workshop*, Tamworth p. 118.
- Walters, P. J. and Bishop, A. L. (1978). Pest management of lucerne aphids. *Lucerne Aphid Workshop*, Tamworth p. 259.
- Walters, P. J. and Dominiak, B. D. (1978). Monthly survey of abundance and damage of lucerne aphids in N.S.W. *Lucerne Aphid Workshop*, Tamworth p. 44.
- Walters, P. J. and Dominiak, B. D. (1978). Field studies of lucerne aphid populations and their interactions with natural enemies in Hunter River lucerne. *Lucerne Aphid Workshop*, Tamworth, p. 47.
- Walters, P. J. and Dominiak, B. D. (1978). Importance of methodology when assessing insecticide trials under constant reinvasion pressure by lucerne aphids. *Lucerne Aphid Workshop*, Tamworth, p. 163.
- Walters, P. J. and Kent, D. (1978). Population dynamics of SAA and subsequent plant response of five lucerne varieties in a potted seedling trial. *Lucerne Aphid Workshop*, Tamworth, p. 184.
- Walters, P. J. and Kent, D. (1978). Population dynamics of BGA and subsequent plant response of six lucerne varieties in a potted seedling trial. *Lucerne Aphid Workshop*, Tamworth, p. 187.
- Walters, P. J. and Skidmore, A. (1978). Interactions of *Acyrtosiphon kondoi* Shinji populations with lucerne seedlings. *Lucerne Aphid Workshop*, Tamworth, p. 178.
- Walters, P. J. and Bishop, A. L. (1979). Irrigation and its effect on the incidence of *Entomophthora* spp. in blue green aphids on lucerne. 3rd Australian Applied Entomological Research Conference, Lawes, Queensland. Working papers p. 8-12.

Post-graduate Theses

- Attia, F. I. (1978). Insecticide resistance in moth pests of grain and stored products (Lepidoptera: Pyralidae). Ph.D. thesis, University of New South Wales.
- Bishop, A. L. (1979). The role of spiders as predators in a cotton ecosystem. M.Sc. thesis, University of Queensland.
- Fletcher, M. J. (1978). The taxonomy, reproduction and development of the fulgoroid homopterans *Scolypopa australis* (Walker) (Ricaniidae) and *Kallitambinia australis* Muir. (Tropiduchidae). Ph.D. thesis, University of Sydney.
- Thwaite, W. G. (1978). Integrated pest control in apples and the migration and dispersal of codling moth, *Cydia pomonella* (Linnaeus) in a Bathurst, N.S.W. orchard. M.Sc. thesis, University of New South Wales.
- Treverrow, N. L. (1979). The behaviour of larvae of the cattle tick (*Boophilus microplus*) in north-eastern N.S.W.: laboratory and field tests. M.Rur.Sc. thesis, University of New England.

Other Publications

- Beattie, G. A. C. (1979). Control of hard wax scale. *Rural Newsletter* 70: 35.
- Beattie, G. A. C. (1979). Will citrus red mite be a serious pest of coastal citrus orchards? *Rural Newsletter* 71: 20.
- Clift, A. D. (1978). Recent developments in pest control in the mushroom industry. *Australian Mushroom Growers Annual* 1: 32.
- Jones, E. L. (1978). Bloodworms and snails. *Farmers Newsletter IREC Large Area* 108: 8.
- Jones, E. L., Kable, P. F. and Sproule, R. S. (1978) MIA Orchard Spray Calendar. 14th edition, 60 pp.
- Hamilton, J. T. (1979). The tomato caterpillar. *Rural Newsletter* 70: 32.

DIVISION OF DAIRYING

New South Wales Department of Agriculture Publications

- Buesnel, R. J. (1979). Make life easier with electric fencing. *Dairy Topics* 21: 12.
- Buesnel, R. J. (1979). Contentment feeding. *Dairy Topics* 21: 27.
- Calder, B. O. E. (1978). How to check your milking machines. *Dairy Topics* 20: 21.
- Chittick, J. B. (1979). Code of practice for dairy factories. *Dairy Topics* 22: 13.
- Critchley, D. (1978). Milking machine demonstration unit. *Dairy Topics* 20: 32.
- Critchley, D. (1979). Cell counts reduced by good management. *Dairy Topics* 21: 17.
- Division of Dairying Officers (1979). Sire surveys for A. B. bulls. *Dairy Topics* 22: 3.
- Division of Dairying Officers (1979). Retirement of Mr C. K. Hart. *Dairying Topics* 22: 24.
- Division of Dairying Officers (1979). The N.S.W. dairy industry. *Division of Dairying Bulletin* A1.0.1.
- Freckelton, D. A. (1978). The green docket. *Dairy Topics* 19: 11.
- Freckelton, D. A. (1978). Mating heifers by A.I. *Dairy Topics* 20: 17.
- Freckelton, D. A. (1978). High energy feeds needed to raise solids-not-fat. *Dairy Topics* 20: 20.
- Freckelton, D. A. (1979). A simple pedigree you can keep and use. *Dairy Topics* 22: 17.
- Freckelton, D. A. (1979). The princess and the S.E.P. *Dairy Topics* 22: 19.
- Griffiths, C. (1978). Feeding for polyunsaturated cheese. *Dairy Topics* 19: 25.
- Griffiths, C. and Laffan, R. (1978). Kikuyu hay on the north coast. *Dairy Topics* 20: 27.
- Heptonstall, D. B., Stevens, G. J. (1979). Breeds of dairy cattle. *Division of Dairying Bulletin* A1.0.2.
- Heptonstall, D. B. (1978). Condition scoring of dairy cattle. *Dairy Topics* 19: 2.
- Hall, C. (1978). Dairying in Pakistan. *Dairy Topics* 19: 8.
- Hoare, B. (1978). Perseverance pays off. *Dairy Topics* 20: 24.
- Heptonstall, D. B. (1979). Breeding calendars reduce calving intervals. *Dairy Topics* 21: 9.
- Kratz, J. (1978). Old butter factory makes cheese. *Dairy Topics* 20: 18.
- Logue, I. (1978). Safety in your dairy. *Dairy Topics* 20: 11.
- Lees, F. (1979). Do it yourself—and save. *Dairy Topics* 21: 24.
- O'Toole, D. K. (1979). Starter cultures for cheesemaking S38.
- O'Toole, D. K. (1979). Antibiotics in milk. *Dairy Topics* 19: 31.
- Potts, K. (1978). Opening of new cheese factory at Comboyne. *Dairy Topics* 19: 22.
- Rathore, A. K. (1979). Strategy of mastitis control. *Dairy Topics* 21: 15.
- Russell, R. J. (1978). Cobblestone cowyards—a link with the past. *Dairy Topics* 19: 27.
- Russell, R. J. (1978). Seventy years of Jerseys. *Dairy Topics* 19: 28.
- Smith, R. A. (1978). The effect of calving condition on lactation performance. *Dairy Topics* 19: 15.
- Sjostedt, J. (1978). Dave Walton's water budget. *Dairy Topics* 19: 19.
- Smith, R. (1978). Highest production for lowest cost . . . which feeding system is best. *Dairy Topics* 20: 3.
- Salkeld, J. (1978). How to check your milking machines. *Dairy Topics* 20: 21.
- Stevens, G. (1978). Tail painting for oestrus detection. *Dairy Topics* 20: 29.
- Sheldrake, R. F. (1979). How to use iodine teat dips and emollients. *Dairy Topics* 21: 20.
- Sheldrake, R. (1979). Cell counts reduced by good management. *Dairy Topics* 21: 17.
- Simpson, P. (1979). Some thoughts on long-term finance. *Dairy Topics* 22: 10.
- Stevens, G. (1979). New herd recording computer programmes. *Dairy Topics* 22: 15.
- Stewart, B. (1978). Powered boom gates for dairy yards. *Division of Dairying Bulletin* A1.1.1.
- Stewart, B. (1979). Low-cost answer to a high-cost problem. *Dairy Topics* 22: 21.
- Thompson, B. and Royal, A. (1978). Solids-not-fat research on the farm. *Dairy Topics* 19: 3.

Contributions to Technical Conferences

- Rathore, A. K. (1978). Scrotal wool cover and fertility in merino rams. *Proceedings, Fourth World Conference on Animal Production*, Buenos-Aires, Argentina 21-26th August p.1.
- Rathore, A. K. (1978). Order of cow entry for milking and its relationship with milk yield in dairy cows. *Proceedings, First World Conference on Ethology (Animal Behaviour) Applied to Zootechnics*, Madrid, Spain 23-27th October E: 1.3: 53.

Other Publications

- Rathore, A. K. (1978). *Dairy Product Markets Commodity Bulletin* 7 (4): 17.

DIVISION OF EXTENSION SERVICES

New South Wales Department of Agriculture Publications

- Bisset, I. J. (1979). Book reviews on farm dams for wildlife and stock and land law and wildlife in N.S.W. *Agricultural Gazette of N.S.W.* 90 (3): 22.
- Bisset, I. J. (1979). Help on its way for agriculture students. *Agricultural Gazette of N.S.W.* 90 (3): 22.
- Seatonberry, J. J. (1978). Where are we with triticale? *Agricultural Gazette of N.S.W.* 89 (5): 9.
- Seatonberry, J. J. (1978). Brucellosis: its days are numbered. *Agricultural Gazette of N.S.W.* 89 (6): 14.

Contributions to Technical Conferences

- Fardy, D. T. (1979). What extension researchers have been doing in Australia—summary of researcher's papers. *Proceedings, National Workshop on Extension Research*, Sydney University P. 12.

DIVISION OF HORTICULTURE

New South Wales Department of Agriculture Publications

- Anon. (1978). Fruit and vine census at 31st December, 1977 Division of Horticulture.
- Anon. (1978). The vegetable industry. *Division of Horticulture Bulletin* H 1.5.7.

- Anon. (1978). The potato industry. *Division of Horticulture Bulletin H 1.5.8*.
- Beattie, B. B. (1979). Apple and pears. *Commodity Bulletin 7* (7): 25.
- Beattie, B. B. (1979). Citrus. *Commodity Bulletin 7* (7): 28.
- Beckingham, C., and Davies, L., (1979). Broccoli production in the Macquarie Valley—costs and returns. *Farm Business Notes* No. 10.
- Boorman, L. K. (1978). Fruitgrowing in the Batlow District. *Division of Horticulture Bulletin H 1.1.7*.
- Boorman, L. K. (1978). Vegetable growing in the Southern Region. *Division of Horticulture Bulletin H 1.1.22*.
- Boorman, L. K. and Sweedman, R. (1978). Trailing berry and bush fruits. *Division of Horticulture Bulletin H 3.1.11*.
- Davey, P. C. (1979). Canning fruit. *Commodity Bulletin 7* (7): 30.
- Davey, P. C. (1979). Wine grapes and dried vine fruit. *Commodity Bulletin 7* (7): 33.
- Dirou, J. F. and Sweetman, R. (1978). Plum growing. *Division of Horticulture Bulletin H 5.1.3*.
- Duncan, J. H. (1978). Citrus culture in the U.S.A. and Nuevo Leon State, Mexico. Report on a study tour 1977. *N.S.W. Department of Agriculture*.
- Gane, W. B. (1978). Orchard layout and planting. *Division of Horticulture Bulletin H 1.2.5*.
- Johnson, J. F. (1978). Choosing apple varieties for new plantings. *Agricultural Gazette of N.S.W.* **89** (5): 31.
- Johnson, J. F. (1979). Some aspects of pome fruit growing in New Zealand. Study tour 1979.
- Johnson, J. F., Penrose, L. J. and Thwaite, W. G. (1979). Deciduous fruits spray calendar.
- Logan, B. J. and Dirou, D. F. (1978) in C. R. Turkington, ed., Chemical control of harvest time of d'Agen prunes. *Prune Research at Young* (1973–1977).
- Meekins, L. (1978). Shallots, leeks and chives. *Division of Horticulture Bulletin H 8.1.7*.
- Menzies, A. R. (1978). Too few or too small—regulate your apple crop. *Agricultural Gazette of N.S.W.* **89** (6): 4.
- Menzies, A. R. and Trimmer, W. A. (1978). Mechanically hedging apple and pear trees. *Agricultural Gazette of N.S.W.* **89** (4): 33.
- Salvestrin, G. L. (1978). Growing Filbert Nuts. *Division of Horticulture Bulletin H 3.1.4*.
- Sarooshi, R. A. Blundell, D. R. and Peasley, D. L. (1979). Blemishes and abnormalities of Avocado fruit. *Agricultural Gazette of N.S.W.* **90** (2): 18.
- Scott, L. A. (1978). Fruitgrowing in the Gosford District. *Division of Horticulture Bulletin H 1.1.8*.
- Scott, L. A. (1979). Drainage for coastal orchards. *Division of Horticulture Bulletin H 2.3.7*.
- Scott, L. A. (1979). Irrigation systems on the Central Coast. *Division of Horticulture Bulletin H 2.3.8*.
- Sproule, R. S., McIntosh, C. B. and Creecy, H. (1979). Fruitgrowing in the Lower Murray Districts. *Division of Horticulture Bulletin H 1.1.21*.
- Stannard, M. C. with Wishart, R. L. (South Australian Department of Agriculture) and Heslop, H. A. (Victorian Department of Agriculture) (1978). *Australian Viticulture*.
- Sumeghy, J. B., Mutton, L. L. and Sinclair P. J. (1978). Better tomatoes for mechanical harvesting. *Agricultural Gazette of N.S.W.* **89** (5): 37.
- Sweedman, R. (1978). Berry and miscellaneous fruit crops of New Zealand—report on a study tour.
- Sweedman, R. (1978). Chinese gooseberry. *Division of Horticulture Bulletin H 3.1.2*.
- Sweedman, R. (1978). Growing Pecan Nuts. *Division of Horticulture Bulletin H 3.1.7*.
- Sweedman, R. (1978). Growing strawberries. *Division of Horticulture Bulletin H 3.1.10*.

Contributions to Journals

- Beattie, B. B. and Folley, R. R. W. (University of London) (1978). Production variability in apple crops II. The long-term behaviour of the English crop. *Scientia Horticulturae* **8** (4): 325.
- Bevington, K. B. and Bacon, P. E. (1978). Effect of hedging on the productivity of Valencia orange trees. *Australian Journal of Experimental Agriculture and Animal Husbandry* **18**: 593.
- Freeman, B., Albrigo, L. G. (University of Florida) and Biggs, R. H. (University of Florida) (1979). Cuticular waxes of developing leaves and fruit of blueberry, *Vaccinium ashei* Reade "Bluegem". *Journal of the American Society of Horticultural Science* **104** (3): 398.
- Hedberg, P. R. (1979). Table grape storage. *Journal of Food Technology Australia* **31**: 80.
- Koffman, W., Penrose, L. J., Menzies, A. R., Davis, K. G. and Kaldor, Jill (1978). Control of benizimidazole—tolerant. *Penicillium expansum* in pome fruit. *Scientia Horticulturae* **9**: 31.
- Morris, S. C. and Nicholls, P. J. (1978). An evaluation of optical density to estimate fungal spore concentrations in water suspensions. *Phytopathology* **68** (8): 1240.
- Sarooshi, R. A. and Roberts, E. A. (1978). Effect of date of pruning, timing, number and composition of oil emulsion sprays on harvest pruned Sultan. *American Journal of Enology and Viticulture* **29**: 233.
- Sarooshi, R. A. and Roberts, E. A. (1979). Effect of trellising crown bunch handling and the number of oil emulsion and gibberellic acid sprays on harvest pruned Sultan. *Australian Journal of Experimental Agriculture and Animal Husbandry* **19**: 122.
- Scott, K. J. with Wills, R. B. H. (University of N.S.W.) and Franklin, M. J. (CSIRO). Effect of minerals and geraniol on levels of abscisic acid and the development of storage breakdown in apples. *Journal of Horticultural Science* **53**: 323.
- Sumeghy, J. B., Mutton, L. L. and Sinclair, P. J. (1978). Evaluation of tomatoes for processing and mechanical harvesting in N.S.W. *Journal of the Australian Institute of Agricultural Science* **44** (2): 135.
- Sumeghy, J. B., Mutton, L. L. and Lee, T. H. (University of N.S.W.) (1978). Report on testing of processing tomato cultivars 1977–78. *Food Technology in Australia* **30** (11): 44.
- Sumeghy, J. B. (1979). Factors affecting the success of mechanically harvested tomatoes in N.S.W. *Food Technology in Australia* **31** (4): 168.
- Wade, N. L. and Bishop, D. G. (Macquarie University) (1978). Changes in the lipid composition of ripening banana fruits and evidence for an associated increase in cell membrane permeability. *Biochimica et Biophysica Acta* **529**: 454.

Contributions to Technical Conferences

- Batten, D. J. (1978). Potential limitations to litchi (*Litchi chinensis* Sonn.) cultivation in Australia. *XXth International Horticultural Congress*, Sydney Abstract 1591.
- Batten, D. J. and Ashford, A. (University of Sydney) (1978). Auxin-induced root formation in Mung bean hypocotyls: the auxin-sensitive phase and the "target" cells involved in the first cell divisions. *XXth International Horticultural Congress*, Sydney Abstract 1044.
- Batten, D. J. and Turner, D. W. (1978). Calculation of heat and chilling sums from daily maximum and minimum temperatures and daylength. *XXth International Horticultural Congress*, Sydney Abstract 1599.

- Beattie, B. B. (1978). Australia's position in the world trade of horticultural products. *XXth International Horticultural Congress*, Sydney Abstract 1017.
- Beattie, B. B. (1978). An estimation of costs and benefits from horticultural research. *XXth International Horticultural Congress*, Sydney Abstract 1060.
- Bevington, K. B. and Bacon, P. E. (1977). Effect of rootstocks on the response of Navel orange trees to dwarfing inoculations. *Proceedings of the International Society of Citriculture*, Orlando, Florida 2: 567.
- Bevington, K. B. et al. (1977). Methods to control alternate cropping of Valencia orange trees in Australia. *Proceedings of the International Society of Citriculture*, Orlando, Florida 2: 704.
- Bevington, K. B., Greenhalgh, W. J. (University of Sydney) and McWhirter, K. S. (University of Sydney) (1978). Forecasting rootstock-scion incompatibility in citrus. *XXth International Horticultural Congress*, Sydney Abstract 1278.
- Bevington, K. B. and Duncan, J. H. (1978). The influence of rootstocks on the performance of Ellendale tangor. *XXth International Horticultural Congress*, Sydney Abstract 1280.
- Bevington, K. B. with Gallash, P. T. (South Australian Department of Agriculture), Hocking, D. and Moss, G. I. (CSIRO) (1978). Ethephon thinned heavy crops of Valencias in three widely spaced districts of Australia. *XXth International Horticultural Congress*, Sydney Abstract 1336.
- Bevington, K. B. with Moss, G. I. (CSIRO) (1978). The influence of rootstock on the response of Valencia orange trees to applied growth regulators. *XXth International Horticultural Congress*, Sydney Abstract 1331.
- Blanch, E. C., Creedy, H. with Emmett, R. W. (Victorian Department of Agriculture) and Ward, J. R. (Bayer Australia Limited) (1978). Effect of a range of fungicides on grapevine black spot. *XXth International Horticultural Congress*, Sydney Abstract 1379.
- Bowen, R. W. J., Pulver, R. and Blakney, A. (1978). Characteristics of Tuberosum x Andigena hybrids and *Solanum goniocalyx* lines at two altitudes. *XXth International Horticultural Congress*, Sydney Abstract 1688.
- Bowen, R. W. J., Archer, K. A. and Rogan, I. (1978). High protein potatoes: their breeding and use in animal nutrition. *XXth International Horticultural Congress*, Sydney Abstract 1782.
- Campbell, J. E. (1978). Effect of training systems on apple quality and yield. *XXth International Horticultural Congress*, Sydney Abstract 1545.
- Cox, J. E. (1978). Valencia rootstock trial, Horticultural Research Station, Gosford. *XXth International Horticultural Congress*, Sydney Abstract 1279.
- Cox, J. E. (1978). Lemon nutrition trial at Gosford, N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1347.
- Cox, J. E. (1978). The effect of fruit and runner production on the subsequent cropping behaviour of the strawberry. *XXth International Horticultural Congress*, Sydney Abstract 1482.
- Darley, E. (1978). The lucky people—a new potato every day. *XXth International Horticultural Congress*, Sydney Abstract 1799.
- Darley, E. (1979). Seed source trials at Robinson, N.S.W. *Australian Potato Research Conference*, Cowes. Working papers.
- Darley, E. (1979). Nutritional investigations at Robinson, N.S.W. *Australian Potato Research Conference*, Cowes. Working papers.
- Darley, E. (1979). Industry location, production and change—N.S.W. *Australian Potato Research Conference*, Cowes. Working papers.
- Davey, P. and Lahiff, P. (1978). Mechanical aids for citrus harvesting. *XXth International Horticultural Congress*, Sydney Abstract 1272.
- Duncan, J. H. (1978). The citrus industry in N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1235.
- Duncan, J. H., Sproule, R. S. and Bevington, K. B. (1978). Commercial use of citrus dwarfing. *XXth International Horticultural Congress*, Sydney Abstract 1351.
- Eady, C. A. (1978). History and development of the Williams banana. *XXth International Horticultural Congress*, Sydney Abstract 1650.
- Freeman, B., Albringo, L. G. (University of Florida) and Biggs, R. H. (University of Florida). The chemistry and ultrastructure of the cuticular waxes of developing leaves and fruit of blueberry (*Vaccinium ashei* Reade) "Blue Gem". *XXth International Horticultural Congress*, Sydney Abstract 1039.
- Freeman, B. M. (1978). Factors affecting periodicity of root growth of grapevines. *XXth International Horticultural Congress*, Sydney Abstract 1357.
- Freeman, B. M. (1978). Vine response to mechanical pruning. *XXth International Horticultural Congress*, Sydney Abstract 1391.
- Freeman, B. M. (1978). Irrigation and pruning level effects on wine quality. *XXth International Horticultural Congress*, Sydney Abstract 1430.
- Freeman, B. M., Lee, T. H. (University of N.S.W.) and Turkington, C. R. (1978). Irrigation and pruning level interactions on growth and yield of grapevines. *XXth International Horticultural Congress*, Sydney Abstract 1387.
- Grieve, A. M. and Walker, R. R. (CSIRO) (1978). Salt avoidance by citrus rootstocks. *XXth International Horticultural Congress*, Sydney Abstract 1277.
- Grieve, A. M. (1979). Comparative efficiency of under tree watering systems for citrus. *I.C.I.D. Irrigation Efficiency Seminar*, Sydney p. 187.
- Hedberg, P. R. (1978). Shiraz spacing and trellising. *XXth International Horticultural Congress*, Sydney Abstract 1384.
- Hedberg, P. R. (1978). Grape berry abscission at harvest. *XXth International Horticultural Congress*, Sydney Abstract 1419.
- Hedberg, P. R. (1978). Rootstocks for Shiraz—yield and wine quality. *XXth International Horticultural Congress*, Sydney Abstract 1426.
- Huett, D. O. (1978). Evaluation of introduced sweet potato cultivars in N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1695.
- Hutton, R. J. (1978). Abscission chemicals for late Valencia oranges in the Murrumbidgee Irrigation Areas in N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1329.
- Hutton, R. J. (1978). Low temperature injury of peaches in relation to weight lost during cool storage. *XXth International Horticultural Congress*, Sydney Abstract 1211.
- Hutton, R. J. and Brown, G. A. (1978). Advances in mechanical harvesting of temperate tree fruits. *XXth International Horticultural Congress*, Sydney Abstract 1555.
- Hutton, R. J. and Dirou, J. F. (1978). Tree shaker thinning for processing tree fruits. *XXth International Horticultural Congress*, Sydney Abstract 1547.
- Hutton, R. J. and Greenhalgh, W. J. (University of Sydney) (1978). Growth regulators as an aid to mechanical harvesting of sweet cherries. *XXth International Horticultural Congress*, Sydney Abstract 1549.

- Hutton, R. J. and Greenhalgh, W. J. (University of Sydney) (1978). Mechanical harvesting of sweet cherries for processing. *XXth International Horticultural Congress*, Sydney Abstract 1551.
- Hutton, R. J. and Kable, P. F. (1978). Postharvest dips for rot control in mechanically harvested fruit. *XXth International Horticultural Congress*, Sydney Abstract 1110.
- Hutton, R. J., Brown, G. A. and Greenhalgh, W. J. (University of Sydney) (1978). Machine harvest concepts for fresh market cherries. *XXth International Horticultural Congress*, Sydney Abstract 1550.
- Ireland, G. (1978). Potato seed source trial—Dorrigo, N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1668.
- Koffman, W., Kable, P. F. and Kaldor, Jill (1978). Postharvest fungicides for the control of brown rot and transit rot of stone fruits. *XXth International Horticultural Congress*, Sydney Abstract 1168.
- Koffman, W., Penrose, L. S. and Kaldor, Jill (1978). Alternative fungicides for postharvest control of benzimidazole tolerant *Sclerotinia frusticola*. *XXth International Horticultural Congress*, Sydney Abstract 1109.
- Koffman, W., Penrose, L. S., Menzies, A. R., Davis, K. C. and Kaldor, Jill (1978). Studies on benzimidazole tolerant blue mould (*Penicillium expansum*). *XXth International Horticultural Congress*, Sydney Abstract 1170.
- Logan, B. J. (1978). Factors determining yield of potatoes in arid areas of N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1711.
- Logan, B. J. and Dirou, J. F. (1978). The effect of several growth regulators on the maturity of prunes. *XXth International Horticultural Congress*, Sydney Abstract 1473.
- Logan, B. J. and Hutton, R. J. (1978). Optimum maturity of Golden Queen peaches for once-over harvest. *XXth International Horticultural Congress*, Sydney Abstract 1495.
- Logan, B. J. (1979). Frequency of irrigation of potatoes grown on sandhills in south western N.S.W. *Australian Potato Research Conference*, Cowes. Working papers.
- Long, J. K., Fraser, L., Bacon, P. and Broadbent, Patricia (1977). The Benton citrange: a promising *Phytophthora* resistant rootstock for citrus trees. *Proceedings of the International Society of Citriculture*, Orlando, Florida 2: 541.
- Long, J. K., Fraser, L., Broadbent, Patricia and Duncan, J. H. (1977). Dwarfing of citrus trees by inoculation with a pathogen. *Proceedings of the International Society of Citriculture*, Orlando, Florida 3: 866.
- Long, J. K., and Roberts, E. A. (1978). Control of SOPP injury in oranges with pH control. *XXth International Horticultural Congress*, Sydney Abstract 1171.
- Menzies, A. R. (1978). Chemical and mechanical thinning of nectareds. *XXth International Horticultural Congress*, Sydney Abstract 1470.
- Menzies, A. R. and Greenhalgh, W. J. (1978). Tree training systems for dessert peaches. *XXth International Horticultural Congress*, Sydney Abstract 1544.
- Morris, S. C. (1978). Investigations into keeping quality of sweet potatoes. *XXth International Horticultural Congress*, Sydney Abstract 1113.
- Morris, S. C. (1978). Postharvest sweet potato pathogens. *XXth International Horticultural Congress*, Sydney Abstract 1186.
- Morris, S. C., Wild, B. L. and Rippon, L. E. (1978). Increase of sour rot in citrus associated with *penicillium digitatum* and benomyl dipping. *XXth International Horticultural Congress*, Sydney Abstract 1105.
- Morris, S. C. with McGlasson, W. B. (CSIRO), Tigchelaar, E. C. (Purdue University), Beal, P. R. (Queensland Department of Primary Industry), Blake, J. R. (Queensland Department of Primary Industry) and Kruger, N. S. (Queensland Department of Primary Industry) (1978). Utility of F₁ nor hybrid tomatoes. *XXth International Horticultural Congress*, Sydney Abstract 1176.
- Mutton, L. L. (1978). Environmental effects on the ripening response of tomatoes to ethephon. *XXth International Horticultural Congress*, Sydney Abstract 1738.
- Pulver, R. J. (1978). Potato growth responses under varied density and sprouting regimes. *XXth International Horticultural Congress*, Sydney Abstract 1731.
- Pulver, R. J. (1978). Potato crop management for irrigated sandhill areas. *XXth International Horticultural Congress*, Sydney Abstract 1806.
- Richens, K. F. and Slack, J. (1979). Criteria for design and operation of a microjet irrigation system on Murrumbidgee Irrigation Area sandhill soils. *Irrigation Efficiency Seminar*, Sydney.
- Rigney, C. J. and Seberry, J. A. (1978). Disinfestation of Queensland fruit fly in oranges. *XXth International Horticultural Congress*, Sydney Abstract 1163.
- Rigney, C. J. and Seberry, J. A. (1978). Disinfestation of light brown apple moth in fruit. *XXth International Horticultural Congress*, Sydney Abstract 1164.
- Rippon, L. E. (1978). Citrus mould resistance in N.S.W., Australia. *XXth International Horticultural Congress*, Sydney Abstract 1104.
- Rippon, L. E. (1978). Control of sour rot (*Geotrichum candidum*) in citrus fruits. *XXth International Horticultural Congress*, Sydney Abstract 1106.
- Rippon, L. E. (1978). Control of sour rot in citrus. *XXth International Horticultural Congress*, Sydney Abstract 1162.
- Sarooshi, R. A. (1978). Trellis drying of Sultana grapes: effect of trellising. *XXth International Horticultural Congress*, Sydney Abstract 1421.
- Sarooshi, R. A. and Bevington, K. B. (1978). Influence of rootstocks on the performance of Muscat Gordo Blanco. *XXth International Horticultural Congress*, Sydney Abstract 1401.
- Sarooshi, R. A. and Creecy, H. (1978). Production of early rockmelons. *XXth International Horticultural Congress*, Sydney Abstract 1709.
- Scott, K. J. (1978). Improving the storage and transport of bananas at ambient temperatures by the use of modified atmospheres and an ethylene absorbent. *XXth International Horticultural Congress*, Sydney Abstract 1231.
- Scott, K. J. (1978). Storage of bananas without refrigeration. *XXth International Horticultural Congress*, Sydney Abstract 1174.
- Scott, K. J. (1978). Technology of quality control of horticultural produce during storage and transport. *Rural and Allied Industries Conference*, Perth.
- Scott, K. J. and Wills, R. B. H. (University of N.S.W.) (1978). Deep dipping—a means for increasing the calcium content of apples. *XXth International Horticultural Congress*, Sydney Abstract 1175.
- Scott, K. J. and Wills, R. B. H. (University of N.S.W.) (1978). Vacuum and pressure treatments for infiltrating calcium into apple fruits. *XXth International Horticultural Congress*, Sydney Abstract 1218.
- Scott, K. J., Wills, R. B. H. (University of N.S.W.) and Scriven, F. M. (University of N.S.W.) (1978). Metabolism of low temperature breakdown in apples. *XXth International Horticultural Congress*, Sydney Abstract 1184.
- Scott, K. J. with Wills, R. B. H. (University of N.S.W.) and Wimalasiri, P. (University of N.S.W.) (1978). Short term controlled atmosphere storage to retard metabolism. *XXth International Horticultural Congress*, Sydney Abstract 1208.
- Scott, K. J. (1979). Low cost treatments for tropical fruits and vegetables. *Proceedings of 1979 Annual Conference, Consultants Section, Australian Institute of Agricultural Science*, Sydney.

- Sinclair, P. J., Abbott, T. S. and Brownell, J. R. (1978). Improvement of furrow irrigation of vegetables in structurally unstable soils. *XXth International Horticultural Congress*, Sydney Abstract 1708.
- Slack, J., Turpin, J. W. and Duncan, J. H. (1979). Trickle v. Draghose Sprinkler irrigation of young citrus on coarse sands. *Irrigation Efficiency Seminar*, Sydney.
- Stevenson, D. R. G. (1978). Bunch trimming of bananas at Coffs Harbour, N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1572.
- Stevenson, D. R. G. (1978). Banana growing tactics adopted in the cooler areas of N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1594.
- Stevenson, D. R. G. (1978). Horticultural (fruit) extension on the North Coast of N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1633.
- Sumeghy, J. B. (1978). Mechanized processing tomato production in N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1800.
- Trochoulas, T. (1978). Yield and root distribution of trickle irrigated bananas. *XXth International Horticultural Congress*, Sydney Abstract 1593.
- Trochoulas, T. and Broadbent, Patricia (1978). Comparison of soil management regimes for avocados. *XXth International Horticultural Congress*, Sydney Abstract 1600.
- Turkington, C. R. (1978). Pruning and trellising of Shiraz. *XXth International Horticultural Congress*, Sydney Abstract 1385.
- Turkington, C. R. (1978). Retardation of grape maturity. *XXth International Horticultural Congress*, Sydney Abstract 1433.
- Turner, D. W. (1978). Growth and development of tropical and sub-tropical fruit crops. *XXth International Horticultural Congress*, Sydney Abstract 1567.
- Turner, D. W. (1978). A mathematical formulation of banana leaf growth. *XXth International Horticultural Congress*, Sydney Abstract 1581.
- Turner, D. W. and Barkus, B. (1978). Some factors affecting uptake of nutrients by banana plants. *XXth International Horticultural Congress*, Sydney Abstract 1605.
- Turner, D. W. and Barkus, B. (1978). Nutrient flow within a banana plantation. *XXth International Horticultural Congress*, Sydney Abstract 1606.
- Turner, D. W. and Barkus, B. (1978). Nutrient concentrations in a range of banana varieties at Alstonville, N.S.W. *Second Meeting, International Group on Mineral Nutrition of Bananas*, Alstonville, August 1978.
- Turpin, J. W., Cox, J. E. and Duncan, J. H. (1978). Rootstock trials for lemons in N.S.W. *XXth International Horticultural Congress*, Sydney Abstract 1281.
- Turpin, J. W., Duncan, J. H., Slack, J. and McKay, O. L. (1978). Trickle irrigation of young citrus on coarse sands. *XXth International Horticultural Congress*, Sydney Abstract 1326.
- Wade, N. L. and Mutton, L. L. (1978). Ontogenetic differences between two rockmelon cultivars (*Cucumis melo*). *XXth International Horticultural Congress*, Sydney Abstract 1092.
- Wade, N. L. with Bishop, D. G. (CSIRO) (1978). Lipid composition of sweet cherry fruit (*Prunus avium* (L.) L.). *XXth International Horticultural Congress*, Sydney Abstract 1165.
- Wade, N. L. and Bishop, D. G. (CSIRO) (1978). Changes in the lipid composition of ripening banana fruits and evidence for an associated increase in cell membrane permeability. *XXth International Horticultural Congress*, Sydney Abstract 1166.
- Wade, N. L., Morris, S. C. and Wellings, C. (1978). Postharvest diseases of rockmelon fruits (*Cucumis melo*). *XXth International Horticultural Congress*, Sydney Abstract 1111.
- Wade, N. L., Morris, S. C. and Wellings, C. (1978). Postharvest wastage in rockmelon (cantaloupe) fruits, *Cucumis melo* L. *XXth International Horticultural Congress*, Sydney Abstract 1167.
- Worrall, R. J. (1978). Container production of citrus. *XXth International Horticultural Congress*, Sydney Abstract 1290.
- Worrall, R. J. (1978). Using eucalypt sawdust in potting mixes. *XXth International Horticultural Congress*, Sydney Abstract 1839.
- Worrall, R. J. (1978). The effect of mineral nutrition and *phytophthora* on the growth of Waratah (*Telopea speciosissima*). *XXth International Horticultural Congress*, Sydney Abstract 1921.

Other Publications

- Baker, J. D. (1978). A visitors view. *American Vegetable Grower*, 26 (9): 14.
- Blain, R. G. (1979). Herbicide management vines. *I.R.E.C. Farmers Newsletter* 142: 26.
- Davey, P. C. (1978). Prune maturity investigations in the M.I.A. 1978. *I.R.E.C. Farmers Newsletter* 139: 24.
- Davey, P. C. (1978). The M.I.A. wine grapes industry, its problems and its future. *I.R.E.C. Farmers Newsletter* 140: 2.
- Davey, P. C. (1978). Hedging orange trees in the M.I.A. *I.R.E.C. Farmers Newsletter* 141: 20.
- Davey, P. C. (1978). Oils ain't oils. *I.R.E.C. Farmers Newsletter* 141: 24.
- Davey, P. C. (1979). Do you waste money on your fertilizer programme? *I.R.E.C. Farmers Newsletter* 142: 18.
- Davey, P. C. (1979). Prune maturity investigations in the M.I.A. 1978. *Australian Dried Fruits News* 3 February: 9.
- Davey, P. C. and Richens, K. F. (1979). Citrus irrigation management made easy. *I.R.E.C. Farmers Newsletter* 142: 2.
- Duncan, J. H. (1978). Citrus research in the United States of America. *Australian Citrus News* 53: 6.
- Duncan, J. H. (1978). N.S.W. Horticultural reports on U.S. tour. *Australian Citrus News* 54: 4.
- Duncan, J. H. and Turpin, J. W. (1979). The N.S.W. citrus budwood scheme. *The N.S.W. Nurseryman* 3 (14): 27, 3 (15): 9.
- Freeman, B. (1979). Current and new research programmes at the Horticultural Research Station, Gosford. *C.C.A.R.E.C. Rural Newsletter* 70: 6.
- Freeman, B. M. (1978). Experiments in mechanical pruning. *Australian Grape Grower and Winemaker* 172: 58.
- Hedberg, P. R. (1978). Reworking mature grapevines in the spring. *I.R.E.C. Farmers Newsletter* 139: 13.
- Hedberg, P. R. (1978). Table grape developments. *The Australian Grapegrower and Winemaker* 178: 6.
- Hedberg, P. R. (1978). Increasing the size of seedless table grapes. *I.R.E.C. Farmers Newsletter* 142: 21.
- Hutton, R. J. and Slack, J. M. (1978). Managing close planted peaches. *I.R.E.C. Newsletter* 139: 28.
- Hutton, R. J. and Coomber, B. (1978). The economics of mechanical harvesting of canning fruits in the M.I.A. *I.R.E.C. Farmers Newsletter* 141: 6.
- Ireland, G. (1978). North Queensland tour. *Banana Bulletin* 42 (9): 1.
- Ireland, G. (1978). Buying and Selling Plantations. *Banana Bulletin* 42 (10): 3.
- Murison, J. A. (1978). Tomato seedling production. *C.C.A.R.E.C. Rural Newsletter* 68: 8.
- Murison, J. A. (1979). "Its just red copper spray". *C.C.A.R.E.C. Rural Newsletter* 70: 4.

- Murison, J. A. (1979). Bacterial Spot—Do your tomatoes have it? *C.C.A.R.E.C. Rural Newsletter* 70: 10.
- Mutton, L. L., Sumeghy, J. B. and Sinclair, P. J. (1978). In search of better processing tomato varieties. *I.R.E.C. Farmers Newsletter* 139: 4.
- Peasley, D. L. (1979). Banana production problems with "Dog-Ear" leaf. *Banana Bulletin* 42 (2): 10.
- Peasley, D. L. (1979). Hints on judging avocado maturity. *Banana Bulletin* 43 (4): 12.
- Richens, K. F. (1978). Planting tatura trellis peaches. Is your soil ready. *I.R.E.C. Farmers Newsletter* 139: 29.
- Richens, K. F. (1978). Thinning canning peaches. *I.R.E.C. Farmers Newsletter* 141: 12.
- Richens, K. F. (1978). Peach tree deaths. *I.R.E.C. Farmers Newsletter* 141: 13.
- Richens, K. F. (1978). A test for citrus oscillating boom spray machines. *I.R.E.C. Farmers Newsletter* 141: 29.
- Richens, K. F. (1979). Bordeaux spray recommended for M.I.A. growers. *Australian Citrus News* 55 March: 7.
- Rippon, L. E. (1978). Fungicide resistance—implications for post harvest wastage control. *C.C.A.R.E.C. Rural Newsletter* 66: 11.
- Rippon, L. E. (1978). Citrus postharvest mould control. *Australian Citrus News* 54: 8.
- Rippon, L. E. (1978). Wastage control in citrus packaging sheds. *Queensland Citrus Bulletin* June p. 4.
- Rippon, L. E. (1978). Colouring of lemons with Ethephon. *C.C.A.R.E.C. Rural Newsletter* 68: 38.
- Rippon, L. E. (1978). Wastage control in citrus packing sheds. *Citrus Packinghouse Bulletin* 3: 6.
- Rippon, L. E. (1978). Colouring of lemons with Ethephon. *Australian Citrus News* 54 (12): 10.
- Rippon, L. E. (1978). Sodium ortho-phenylphenate dips and pH control. *Queensland Citrus Bulletin* March p. 1.
- Sarooshi, R. A. and Creecy, H. (1978). Spray trials with trellis dried sultanias—Coombealla 1978. *Australian Dried Fruit News* 6 (2): 10.
- Scott, K. J. (1978). Storage of fruits and vegetables for processing. *Processing Fruits and Vegetables*. Edited by P. W. Board (Hawkesbury Agricultural College).
- Scott, K. J. and Hardisty, S. E. (Western Australian Department of Agriculture) (1978). The control of bitter pit in Granny Smith apples grown for export in Western Australia. *CSIRO Food Research Report* No. 132.
- Scott, L. A. (1978). Seasonal reminders. *C.C.A.R.E.C. Rural Newsletter* 67: 28.
- Scott, L. A. (1978). Fertilize your citrus now. *C.C.A.R.E.C. Rural Newsletter* 67: 32.
- Scott, L. A. (1978). Seasonal reminders. *C.C.A.R.E.C. Rural Newsletter* 68: 33.
- Scott, L. A. (1978). Efficient spray application. *C.C.A.R.E.C. Rural Newsletter* 69: 22.
- Scott, L. A. (1978). Seasonal reminders. *C.C.A.R.E.C. Rural Newsletter* 69: 27.
- Scott, L. A. (1978). Co-operators. *C.C.A.R.E.C. Rural Newsletter* 69: 37.
- Scott, L. A. (1979). Seasonal reminders *C.C.A.R.E.C. Rural Newsletter* 70: 39.
- Slack, J. M. (1978). Direct nursery planting of peach hardwood cuttings. *I.R.E.C. Farmers Newsletter* 139: 26.
- Slack, J. M. and Hutton, R. J. (1978). Managing close planted peaches. *I.R.E.C. Farmers Newsletter* 139: 28.
- Sproule, R. S. (1978). Peach leaf curl. *I.R.E.C. Farmers Newsletter* 141: 15.
- Sproule, R. S. (1978). New blossom blight found in stone fruit. *I.R.E.C. Farmers Newsletter* 141: 19.
- Stevenson, D. R. G. (1978). Leaf analysis valuable for correcting imbalance in banana fertilizing programmes. *Banana Bulletin* 42 (7): 4.
- Stevenson, D. R. G. (1978). Some queries on fertilizing bananas. *Banana Bulletin* 42 (10): 4.
- Stevenson, D. R. G. (1979). Liming made easy by aerial application. *Banana Bulletin* 43 (1): 4.
- Stevenson, D. R. G. (1979). Don't get lime in your face. *Banana Bulletin* 43 (2): 10.
- Sumeghy, J. B. (1978). Introduction to plant breeding. *Encyclopaedia of Australian Gardening* 31.
- Wade, N. L. (1978). Storage, transport and ripening of fresh fruit and vegetables. *Processing Fruits and Vegetables*. Edited by P. W. Board (Hawkesbury Agricultural College).

DIVISION OF MARKETING AND ECONOMICS

New South Wales Department of Agriculture Publications

- Baker, N. R. (1978). Oilseeds and summer cereals. *Commodity Bulletin* 7 (2): 13.
- Baker, N. R. (1978). Cereals 78: better nutrition for the world's millions. *Commodity Bulletin* 7 (3): 1.
- Baker, N. R. (1978). Impressions of international cereal and oilseeds markets. *Commodity Bulletin* 7 (4): 1.
- Baker, N. R. (1979). Coarse grains. *Commodity Bulletin* 7 (7): 5.
- Benson, R. J. and Hennessy, G. (1979). Crop and livestock budgets, Mudgee District. *Farm Business Notes* 9.
- Brownscombe, P. G. (1978). Beef marketing margins. *Commodity Bulletin* 6 (12): 24.
- Brownscombe, P. G. (1978). Adjustment in N.S.W. *Commodity Bulletin* 7 (1): 1.
- Brownscombe, P. G. (1978). June '78 Beef price rise—what happened and why? *Commodity Bulletin* 7 (1): 4.
- Brownscombe, P. G. (1978). Tax averaging provisions for primary producers. *Commodity Bulletin* 7 (4): 9.
- Brownscombe, P. G. (1978). The primary industry bank. *Commodity Bulletin* 7 (4): 24.
- Buffier, B. D. (1978). Pigmeat and poultry prospects. *Commodity Bulletin* 7 (7): 19.
- Buffier, B. D. and Scott, B. A. (1978). Lucerne. *Economic and Technical Bulletin* No. 10.
- Buggie, G. J. (1978). Dairy farming at Lynch's Creek: A consensus of costs and returns for a 100 ha farm with a 1337 L/week quota. *Farm Management Notes* 24.
- Buggie, G. J. and Akehurst, A. A. (1978). Growing watermelons. *Farm Management Notes* 23.
- Buggie, G. J. and Akehurst, A. A. (1978). Growing cucumbers. *Farm Management Notes* 22.
- Buggie, G. J. (1979). Primary producer certificates: exemptions from sales tax. *Commodity Bulletin* 6 (1): 10.
- Catt, C. B. C. (1978). Investment in part-time farming. *Commodity Bulletin* 6 (12): 11.
- Compton, B. K. and Baker, N. R. (1978). Conditions in the rural sector of N.S.W. *Commodity Bulletin* 6 (12): 16.
- Coomber, B. B. (1978). M.I.A. citrus growers contain cost increases. *Commodity Bulletin* 7 (3): 14.
- Coomber, B. B. (1978). Alternative wheat production strategies. *Rural Enterprise Newsletter* 25.
- Coomber, B. B. (1978). Development costs for M.I.A. citrus. *Economic Information Series* October.
- Coomber, B. B. and Kennedy, J. R. (1979). Changes in the M.I.A. canning peach industry. *Commodity Bulletin* 7 (10): 15.
- Coomber, B. B. (1979). The Australian wine industry—implications of the I.A.C. enquiry. *Commodity Bulletin* 7 (11): 23.
- Davies, B. L. and Brownscombe, P. (1978). A guide to shared ownership. *Farm Business Notes* 4.
- Davies, B. L., McKinnon, H., and Campbell, D. (1978). Upper Darling irrigation—part I. *Farm Business Notes* 5.

- Davies, B. L. and Shaw, G. (1979). Crop and livestock budgets Warren District—1979. *Farm Business Notes* 6.
- Davies, B. L. and Freebairn, R. (1979). Crop and livestock budgets Coonabarabran District—1979. *Farm Business Notes* 7.
- Davies, B. L. and Mullen, C. (1979). Crop and livestock budgets Dubbo District—1979. *Farm Business Notes* 8.
- Davies, B. L. and Beekingham, C. (1979). Broccoli production in the Macquarie Valley—costs and returns. *Farm Business Notes* 10.
- Davis, D. L., Mullen, J. D. and Bryant, M. J. (1979). Farmer income and expenditure patterns in a wheat-sheep region. *Review of Marketing and Agricultural Economics* 47: 27.
- Durbin, S. (1979). Private trading in wheat: an assessment. *Review of Marketing and Agricultural Economics* 47: 62.
- Forsythe, G. A. (1978). Commodity figures—wool, grain and cattle—for use by growers and by producer boards. *Commodity Bulletin* 6 (12): 1.
- Gilbert, D. M., Bell, A. K. and Martin, J. F. (1978). Tukidales for carpet wool production. *Economic and Technical Bulletin* 21.
- Gilbert, D. M. (1979). The profitability of Tukidale sheep for carpet wool production. *Commodity Bulletin* 7 (10): 1.
- Gisz, P. (1979). *Sources of Rural Finance in N.S.W. Booklet.*
- Godden, D. P. (1978). The resource misallocation costs of equalization—again. *Review of Marketing and Agricultural Economics* 46: 141.
- Godden, D. P. and Drane, F. H. (1978). Selective underwriting v. a market share entitlement scheme for the Australian dairy industry. *Review of Marketing and Agricultural Economics* 46: 348.
- Graham, M. A. and Hayward, M. A. (1978). Regional milk production costs in N.S.W. *Review of Marketing and Agricultural Economics* 46: 342.
- Graham, M. A. (1978). N.S.W. meat production forecast. *Commodity Bulletin* 6 (12): 26.
- Graham, M. A. (1978). N.S.W. meat production forecast. *Commodity Bulletin* 7 (1): 22.
- Graham, M. A. (1978). N.S.W. meat production forecast. *Commodity Bulletin* 7 (4): 32.
- Graham, M. A. (1978). N.S.W. meat production forecast. *Commodity Bulletin* 7 (8/9): 30.
- Griffith, G. R. (1978). An ex-ante evaluation of the National Pig Carcase Measurement and Information Service. *Review of Marketing and Agricultural Economics* 46: 238.
- Griffith, S. J. (1978). A guide to depreciation. *Commodity Bulletin* 7 (4): 27.
- Griffith, S. J. (1978). Index to Commodity Bulletin volume 6 (Nos 1–12)—August, 1977 to July, 1978. *Commodity Bulletin* 7 (5): 16.
- Griffith, S. J. (1979). Australian trade with China. *Commodity Bulletin* 7 (11): 1.
- Griffith, S. J. (1979). Outlook for Wheat. *Commodity Bulletin* 7 (7): 3.
- Griffith, S. J. and Gellatly, C. (1979). Meat marketing margins. *Commodity Bulletin* 7 (11): 19.
- Hayward, M. (1978). Meat marketing margins. *Commodity Bulletin* 6 (12): 23.
- Hayward, M. (1979). 1978 Meat margins. *Commodity Bulletin* 7 (6): 18.
- Harrison, I. (1979). Beef cattle quality and prices. *Commodity Bulletin* 7 (10): 9.
- Hodgkinson, S. A. (1979). Meat meal exports. *Commodity Bulletin* 7 (11): 17.
- Martin, J. F. (1978). N.S.W. regional agricultural production: 1976–77 analysis. *Commodity Bulletin* 7 (1): 12.
- Martin, J. F. (1979). Australian speciality carpet wool production in perspective. *Miscellaneous Bulletin* 30.
- Mohr, G. M. (1978). The benefits from successful Australian poultry research. *Miscellaneous Bulletin* 28.
- Mohr, G. M. (1978). Lucerne hay losses from lucerne aphid infestations in N.S.W. *Commodity Bulletin* 7 (5): 1.
- Mohr, G. M. (1979). Aphid damage to lucerne hay production. *Lucerne Aphid Newsletter* 16.
- Mohr, G. M. and Armstrong, P. (1979). N.S.W.—the premier producer of animal protein foods. *Commodity Bulletin* 7 (6): 1.
- Percival, R. H. (1978). Durum wheat industry to expand. *Commodity Bulletin* 7 (2): 10.
- Percival, R. H. (1978). Lucerne hay prices to remain firm. *Commodity Bulletin* 7 (2): 1.
- Percival, R. H. (1978). Lupins—a new protein source. *Commodity Bulletin* 7 (3): 7.
- Percival, R. H. (1978). Wholesale price of Buckwheat will continue downward trend. *Commodity Bulletin* 7 (5): 11.
- Percival, R. H. (1979). Alcohol fuel from sugar cane—is it economic. *Commodity Bulletin* 7 (6): 13.
- Percival, R. H. (1979). No till following in Northern N.S.W. *Agricultural Gazette of N.S.W.* 90 (3): 42.
- Percival, R. H. (1979). The I.A.C. sugar inquiry: how did the consumer fare? *Commodity Bulletin* 7 (11): 8.
- Reilly, T. L. C. and Godyn, D. L. (1978). Lucerne—does aphid spraying pay? *Agricultural Gazette of N.S.W.* 90 (3): 36.

Contributions to Journals

- Griffith, G. R. and Meilke, K. D. (1979). Relationships among North American fats and oils prices. *American Journal of Agricultural Economics* 61: 335.
- Martin, J. F. (1978). New insights in preservation of coconut timber—the tutu insertion process. *Australian Forest Research* 8 (3): 1.
- Vere, D. T. and Campbell, M. H. (1979). Estimating the economic impact of serrated tussock (*Nassella trichotoma*) in N.S.W. *Journal of Australian Institute of Agricultural Science* 45 (1): 35.

Contributions to Technical Conferences

- Baker, N. R. (1978). Australia's role in the international grain market. *Sixth International Cereal and Bread Congress*, Winnipeg.
- Davies, B. L. (1979). The potential uses of long range rainfall forecasting in the wheat belt of N.S.W. *The Australian Agricultural Economics Society and the Economic Society of Australia and New Zealand*, Melbourne.
- Gellatly, C. with Scobie, G. M. (North Carolina State University) (1979). Incorporating futures prices in commodity models: the U.S. broiler sector. *Livestock Futures Research Symposium*, Chicago Mercantile Exchange.
- Harrison, I. and Richardson, R. A. (University of New England) (1979). Factors affecting the prices of table and manufacturing quality beef cattle in Australia. *Australian Agricultural Economics Society 23rd Annual Conference* Canberra, 6–8 February.
- Mohr, G. M. (1978). On estimating the losses to agriculture from exotic lucerne aphid infestations in N.S.W. *Lucerne Aphid Workshop* Tamworth p. 175.
- Vere, D. T. and Campbell, M. H. (1978). The economic loss caused by serrated tussock (*Nassella trichotoma*) in N.S.W. *Proceedings, First Conference of the Council of Australian Weed Science Societies* 1: 422.
- Vere, D. T. and Campbell, M. H. (1978). Economics of controlling serrated tussock (*Nassella trichotoma*) on the tablelands of N.S.W. *Proceedings, First Conference of the Council of Australian Weed Science Societies* 1: 426.

Post-graduate Thesis

Gellatly, C. (1979). Incorporating futures prices in commodity models: the U.S. broiler sector. Ph.D. thesis, North Carolina State University, U.S.A.

Other Publications

- Bailey, D. R. and Buffier, B. D. (1978). Complan users manual. *Complan Manual No. 1* A.B.R.I. University of New England, Armidale.
- Bailey, D. R. and Buffier, B. D. (1979). Enterprise budgets for the North West of N.S.W. *Complan Handbook No. 2* A.B.R.I. University of New England, Armidale.
- Baker, N. R. (1978). The oilseeds market. *Bulk Wheat* 12: 56.
- Buffier, B. D. (1978). Implications of marketing changes for livestock agents. *K.R.A.U. Miscellaneous Publication* 6.
- Coomber, B. B. (1978). M.I.A. citrus growers contain cost increases. *Australian Citrus News* 7 (3): 1.
- Coomber, B. B. and Hutton, R. (1978). Economics of mechanical harvesting of stone fruits. *I.R.E.C. Farmers' Newsletter* 141: 6.
- Coomber, B. B. (1978). M.I.A. citrus growers contain cost increases. *I.R.E.C. Farmers' Newsletter* 141: 1.
- Griffith, S. J. (1979). Depreciation—buy now and save later. *Power Farming Magazine* 88 (5): 14.
- Harrison, I. and Barnett, C. (1979). Wet feeding of pigs in Australia. *The Pig Farmer* 13 (7): 403.
- Kennedy, J. R. (1978). Irrigated winter cereals and red soils. *I.R.E.C. Farmer's Newsletter* 107: 4.

PESTICIDES REGISTRATION BRANCH

New South Wales Department of Agriculture Publications

Byrnes, C. C. (1978). The Pesticides Act, 1978—its provisions and implications. *Agricultural Gazette of N.S.W.* 89 (5): 2.

DIVISION OF PLANT INDUSTRY

New South Wales Department of Agriculture Publications

- Appleyard, D. (1978). Breakthrough in cereal treatment. *Agricultural Gazette of N.S.W.* 89 (6): 32.
- Banks, L. W. (1979). Harvesting and handling soybeans. *Agricultural Gazette of N.S.W.* 90 (2): 38.
- Campbell, M. H. and Dellow, J. J. (1979). Lucerne and phalaris on hill country north of Bathurst. *Agricultural Gazette of N.S.W.* 90 (3): 34.
- Collett, I. and Dear, B. S. (1978). Establishing pastures under sunflowers. *Agricultural Gazette of N.S.W.* 89 (5): 24.
- Cook, L. J. and Godyn, D. L. (1979). Sub clover seed production can be profitable. *Agricultural Gazette of N.S.W.* 90 (3): 23.
- Cregan, P. D. (1978). Tall fescue. *Division of Plant Industry Bulletin* P2.5.6.
- Cregan, P. D., et al (1978). Namoi woolly pod vetch. *Division of Plant Industry Bulletin* P2.5.9.
- Dale, A. B. (1978). Shedding off-types: a threat to the grain sorghum industry. *Agricultural Gazette of N.S.W.* 89 (5): 12.
- Dear, B. S. (1978). Fertilizer strip tests for permanent pastures. *Agricultural Gazette of N.S.W.* 89 (3): 42.
- Doyle, A. D. and Holford, I. C. R. (1978). For good wheat yields plough that lucerne out early. *Agricultural Gazette of N.S.W.* 89 (6): 35.
- Dymock, A. J. (1978). Red clover. *Division of Plant Industry Bulletin* P2.5.8.
- Fitzsimmons, R. W. (1978). Developments in the oat growing industry. *Agricultural Gazette of N.S.W.* 89 (4): 35.
- Fitzsimmons, R. W. (1978). Fifty years of changes in wheat varieties. *Agricultural Gazette of N.S.W.* 89 (6): 10.
- Fitzsimmons, R. W. with Wrigley, C. W. (CSIRO) (1979). What's wrong with my grain? *Agricultural Gazette of N.S.W.* 90 (1): 38.
- Komoll, R. F. (1978). Wheat variety recommendations: the new scheme. *Agricultural Gazette of N.S.W.* 89 (6): 19.
- Launders, T. E. (1978). Sod-seeding. *Division of Plant Industry Bulletin* P2.2.1.
- McLaughlin, B. D. and Scarsbrick, B. D. (1979). Fertilizing pastures with sulphur. *Agricultural Gazette of N.S.W.* 90 (3): 28.
- Mahon, J. (1978). The first field lupin competition in N.S.W. *Agricultural Gazette of N.S.W.* 89 (4): 22.
- Michalk, D. (1979). Multiple use of rangelands in U.S.A.—some hints for Australia? *Agricultural Gazette of N.S.W.* 90 (1): 39.
- Peterson, J. R. (1979). Seed moisture—how it can work for you. *Agricultural Gazette of N.S.W.* 90 (1): 12.
- Rose, I. A. (1979). Soybean seed quality. *Agricultural Gazette of N.S.W.* 90 (3): 32.
- Scarsbrick, B. D. (1978). Siroso—a phalaris for production and weed control. *Agricultural Gazette of N.S.W.* 89 (4): 18.
- Scarsbrick, B. D. and Cregan, P. (1978). Phalaris. *Division of Plant Industry Bulletin* P2.5.1.
- Scott, B. A. (1979). Planning profitable barley. *Agricultural Gazette of N.S.W.* 90 (2): 36.
- Spence, T. B. (1979). Rapeseed or wheat. *Agricultural Gazette of N.S.W.* 90 (1): 15.
- Strang, J. (1978). Take a tip—gamble on horse beans. *Agricultural Gazette of N.S.W.* 89 (6): 27.
- Toth, J. (1978). Weed control in mechanically harvested tomatoes. *Agricultural Gazette of N.S.W.* 89 (5): 20.
- Wolfe, E. C. and Southwood, O. R. (1979). Lucerne and subterranean clover—a top pasture team. *Agricultural Gazette of N.S.W.* 90 (1): 2.

Contributions to Journals

- Archer, K. A. and Wheeler, J. L. (CSIRO) (1978). Response by cattle grazing sorghum to salt-sulphur supplements. *Australian Journal of Experimental Agriculture and Animal Husbandry* 18 (95): 741.
- Archer, K. A. with Wheeler, J. L. (CSIRO) (1978). Sodium and sulphur both help stock grazing sorghum. *Rural Research* 100: 11.
- Auld, B. A., Dennett, M. D. (Reading University) and Elston, J. (Reading University) (1978). The effect of temperature changes on expansion of individual leaves of *Vicia faba* L. *Annals of Botany* 42: 877.

- Auld, B. A., Menz, K. M. and Medd, R. W. (1978). Bioeconomic model of weeds in pastures. *Agro-Ecosystems* 5: 69.
- Auld, B. A., Menz, K. M. and Monaghan, N. M. (1979). Dynamics of weed spread: implications for policies of public control. *Protection Ecology* 1: 141.
- Auld, B. A., et al (1979). Applied Biology. *Search* 10: 146.
- Colman, R. L. and O'Neill, G. H. (1978). Seasonal variation in the potential herbage production and response to nitrogen by kikuyu grass (*Pennisetum clandestinum*). *Journal of Agricultural Science, Cambridge* 91: 81.
- Cooper, J. L. (1978). Evaporimeter relationships at Yanco, N.S.W. *Journal of the Australian Institute of Agricultural Science* 44: 139.
- Desborough, P. J. (1978). Summer grain legume research. *Tropical Grasslands* 12: 141.
- Doyle, A. D. with Marston, D. (N.S.W. Soil Conservation Service) (1978). Stubble retention systems as soil conservation management practices. *Journal of Soil Conservation Service of N.S.W.* 34: 210.
- FitzGerald, R. D. (1979). A comparison of four pasture types for the wheat belt of southern N.S.W. *Australian Journal of Experimental Agriculture and Animal Husbandry* 19 (97): 216.
- Garden, D. L. (1978). A grazing experiment on the sandstone soils of the upper Clarence. *Tropical Grasslands* 12: 139.
- Garden, D. L., Brooks, D. R. and Bradley, J. (1978). Effects of superphosphate application and cutting interval on native pastures in the Clarence Valley, N.S.W. *Australian Journal of Experimental Agriculture and Animal Husbandry* 18: 718.
- Helyar, K. R. and Godden, D. P. (1978). More on the modelling of fertilizer response. *Journal of Australian Institute of Agricultural Science* 44: 91.
- Hodgson, A. S. (1978). Rapeseed adaptation in northern N.S.W. I. Phenological responses to vernalization, temperature and photoperiod by annual and biennial cultivars of *Brassica campestris* L., *Brassica napus* L. and wheat cv. Timgalen. *Australian Journal of Agricultural Research* 29: 693.
- Hodgson, A. S. (1978). Rapeseed adaptation in northern N.S.W. II. Predicting plant development and its implications for planting time, designed to avoid water deficit and frost. *Australian Journal of Agricultural Research* 29: 711.
- Hodgson, A. S. (1979). Rapeseed adaptation in northern N.S.W. III. Yield, yield components and grain quality of *Brassica campestris* and *Brassica napus* in relation to planting date. *Australian Journal of Agricultural Research* 30: 19.
- Marcellos, H. and Single, W. V. (1979). Supercooling and heterogeneous nucleation of freezing in tissues of tender plants. *Cryobiology* 16: 74.
- May, C. E. and Appels, R. (CSIRO) (1978). Rye chromosome 2R substitution and translocation lines in hexaploid wheat. *Cereal Research Communications* 6: 231.
- McNeill, A. A. and Aveyard, J. M. (N.S.W. Soil Conservation Service) (1978). Reduced tillage systems—their potential for soil conservation. *Journal of the Soil Conservation Service of N.S.W.* 34 (4): 207.
- Mears, P. T. (1978). The maintenance fertilizer requirements of grazed pastures. *Tropical Grasslands* 12: 137.
- Medd, R. W. and Smith, R. C. G. (1978). Prediction of the potential distribution of *Carduus nutans* (nodding thistle) in Australia. *Journal of Applied Ecology* 15: 603.
- Medd, R. W. (1979). Diflufenzoquat and seed viability of wild oats. *PANS* 25: 91.
- Medd, R. W. and Lovett, J. V. (University of New England) (1979). Biological studies of *Carduus nutans* (L.) ssp. *nutans*. I. Germination and light requirement of seedlings. *Weed Research* 18: 363.
- Medd, R. W. and Lovett, J. V. (University of New England) (1979). Biological studies of *Carduus nutans* (L.) ssp. *nutans*. II. Vernalization and phenological development. *Weed Research* 18: 369.
- Monaghan, N. (1978). Problems caused by Sorghum halepense in Australia. *PANS* 24 (2): 172.
- Muldoon, D. K. (1979). Simulation of hybrid pennisetum production in Australia. *Agricultural Systems* 4 (1): 35.
- Murtagh, G. J. (1978). The effect of evaporative demand on the growth of well watered kikuyu. *Agricultural Meteorology* 19: 379.
- Robinson, G. G. and Taylor, J. A. with Whalley, R. D. B. (University of New England) (1978). General effects of management and grazing by domestic livestock on the rangelands of the Northern Tablelands of N.S.W. *Australian Rangeland Journal* 1 (2): 174.
- Spence, T. B. and Smith, A. N. (1978). Granule size of phosphate fertilizers. *Journal of Australian Institute of Agricultural Science* 44 (2): 129.

Contributions to Technical Conferences

- Auld, B. A. and Coote, B. G. (1979). A spreading plant population model. *Proceedings, Second Open Forum on Ecological Research*, Ecological Society of Australia, Griffith University, Queensland p. 10.
- Barber, J. S. (1979). Water requirements of irrigated wheat on heavy clay soil in the Namoi Valley. *Irrigation Efficiency Seminar*, Sydney p. 223.
- Brownlee, H. (1978). Evaluation of aphid resistant lucerne varieties in N.S.W. *Lucerne Aphid Workshop*, Tamworth p. 142.
- Campbell, M. H. (1979). Replacing nitrophilous weeds with improved pastures on unploughed land. *4th Annual General Meeting, Ecological Society of Australia Incorporated* Griffith University, Queensland p. 26.
- Campbell, M. H. (1979). Resisting seed theft by harvesting ants. *4th Annual General Meeting, Ecological Society of Australia Incorporated* Griffith University, Queensland p. 19.
- Constable, G. A. and Rawson, H. M. (1979). Net photosynthesis, respiration and a carbon budget for cotton leaves. *Australian Society of Plant Physiologists, Twentieth General Meeting*, Canberra.
- Cooper, J. L. (1979). Water use efficiency of wheat in the Murrumbidgee Irrigation Area. *Australian National Committee, International Commission on Irrigation and Drainage, Irrigation Efficiency Seminar*, Sydney p. 215.
- Cooper, J. L. and Bacon, P. E. (1979). Effect of nitrogen fertility and stubble management on the growth of wheat sod-seeded in rice stubble. *Australian Soil Science Society Conference*, Yanco.
- Corbin, E. J. (1978). Why grow grain legumes? *Proceedings, 6th Riverina Outlook Conference*, Riverina College of Advanced Education p. 3.1.
- Doyle, A. D. with McKenzie, D. C., So, H. B. (University of New England) and Yates, N. J. (University of New England) (1979). Effect of gypsum application on the exchangeable cations and soluble ions of grey clay profiles. *Australian Soil Science Society Conference*, Yanco.
- Drummond, G. G. and Lattimore, M. E. (1978). The N.S.W. Department of Agriculture Lucerne Breeding Programme. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 215.
- Hartley, R. A. (1979). The rice pure seed scheme. *Australian Rice Workshop*, Yanco (B) 1–2.
- Hartley, R. A. (1979). Improved plant type rice cultivars in N.S.W. *Australian Rice Workshop*, Yanco (B) 6–7.
- Heenan, D. P. (1979). Mid-season topdressing of nitrogen for Inga. *Australian Rice Workshop*, Yanco (C) 20–21.
- Heenan, D. P. (1979). A comparison of sulphur-coated urea and conventional fertilizers for Inga. *Australian Rice Workshop*, Yanco (C) 24–25.

- Heenan, D. P. and Campbell, L. C. (University of Sydney) (1979). Effect of manganese supply on nitrate assimilation in soybeans. *American Society of Plant Physiologists, Annual Conference*, Columbus, Ohio.
- Heenan, D. P., Campbell, L. C. (University of Sydney) and Carter, O. G. (University of Sydney) (1979). Alleviation of manganese toxicity at high temperatures. *World Soybean Research Conference*, North Carolina State University.
- Heenan, D. P., Campbell, L. C. (University of Sydney) and Carter, O. G. (University of Sydney) (1979). Manganese nutrition of soybeans. *World Soybean Research Conference*, North Carolina State University.
- Heenan, D. P. and Lewin, L. G. (1979). Cold temperature sterility in rice. *Australian Rice Workshop*, Yanco (C) 22-23.
- Helyar, K. R. (1979). Sensitivity of principal pasture and crop species to soil acidity with particular reference to aluminium and manganese toxicity, hydrogen ion concentration, calcium and molybdenum deficiency. *Workshop on Acid Soils*, Biological and Chemical Research Institute, Rydalmere p. 16.
- Helyar, K. R. and Curtis, K. M. (1979). Fitting the results of wheat experiments to the Decide model of fertilizer response. *Proceedings, Australian Society of Soil Science Conference*, Yanco p. 92.
- Kemp, D. R. (1979). Diurnal variation to growth rates of wheat leaves in relation to the temperature and carbohydrates of the extension zone. *Australian Society of Plant Physiologists, Twentieth General Meeting*, Canberra.
- Lattimore, M. E. and Drummond, G. G. (1978). Techniques for comparing blue-green aphid resistance in sub-clover varieties and some preliminary results. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 234.
- Leggett, E. K. (1979). Remote Sensing. *Proceedings, Australian Institute of Agricultural Science Consultants Section 1979 Conference*, University of N.S.W.
- Lewin, L. G. (1979). Agronomic aspects of continuous cultivation of rice. *Australian Rice Workshop*, Yanco (C) 41-45.
- Lewin, L. G. (1979). Early flooding of combine sown rice. *Australian Rice Workshop*, Yanco (C) 46-48.
- Lewin, L. G. and Hartley, R. A. (1979). Rice breeding in N.S.W. *Australian Workshop*, Yanco (B) 10-17.
- Lodge, G. M. (1978). Seedling root and shoot growth of some aphid-resistant lucerne varieties. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 130.
- Lodge, G. M. (1978). The effect of dormancy on the winter production and rate of growth of some lucerne varieties. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 136.
- Lodge, G. M. and Greenup, L. R. (1978). Aphid infestations and damage in some legume species. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 190.
- Lodge, G. M. and Greenup, L. R. (1978). Effects of aphids on seedling survival and seed-set of some annual medic species. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 192.
- Lodge, G. M. and Greenup, L. R. (1978). Effect of aphids on the seasonal production of naturalised legumes throughout northern N.S.W. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 195.
- Lodge, G. M., Hamilton, B. A. and Greenup, L. R. (1978). Persistence and production of lucerne varieties under dryland grazing and haycutting. *Proceedings, Lucerne Aphid Workshop*, Tamworth p. 133.
- Marcellos, H. (1979). Frost hardiness and injury to wheat leaves in the field. *Australian Society of Plant Physiologists Twentieth General Meeting*, Canberra.
- May, C. E. (1978). The incorporation of "alien" sources of resistance to *Septoria triticii* into hexaploid wheat. *Proceedings, Australian Septoria Workshop*, Agricultural Research Institute, Wagga Wagga p. 54.
- McNeill, A. A. (1978). A 9-row combine for direct drilling cereal and pasture seed. *Conference on Agricultural Engineering 1978*, Toowoomba p. 1.
- Monaghan, N. M. (1979). Regeneration of sorghum halepense. *2nd Open Forum, Ecological Society of Australia Brisbane* p. 28.
- Murtagh, G. J. (1979). Limitations of kikuyu for use in irrigated pasture. *A.N.C., International Commission on Irrigation and Drainage, Irrigation Efficiency Seminar*, Sydney p. 227.
- Rose, I. A. with McWhirter, K. S. (University of Sydney) (1979). Germplasm sharing in soybean improvement. *World Soybean Research Conference II*. North Carolina State University, Abstracts p. 40.
- Scott, B. J. (1979). Soil acidity in N.S.W.: The extent and severity of the problems on the South West Slopes. *Workshop on Acid Soils*, Biological and Chemical Research Institute, Rydalmere p. 12.
- Thompson, J. A. (1979). Comparative water use efficiencies of maize, grain sorghum, sunflower and soybean. *A.N.C., International Commission on Irrigation and Drainage, Irrigation Efficiency Seminar*, Sydney p. 195.
- Thompson, J. A. (1979). Irrigation management of indeterminate soybeans in a semi-arid environment. *A.N.C., International Commission on Irrigation and Drainage, Irrigation Efficiency Seminar*, Sydney p. 201.
- Toohy, D. E. (1979). Recent trends in irrigation. *Proceedings, Australian Institute of Agricultural Science Consultants Section 1979 Conference*, University of N.S.W.
- Wilson, G. P. M. (1979). A collection of Australian native legumes—is it wise to despise them. *Poster display, International Symposium, Genetic Resources of Forage Plants*, Townsville.
- Wolfe, E. C. (1978). Pasture legumes—their use and problems. *Proceedings, 6th Riverina Outlook Conference*, Wagga p. 5.1.

Post-graduate Thesis

- Hodgson, A. S. (1978). *Rapeseed adaptation in northern N.S.W.* M.Sc.Agr. thesis, University of Sydney.
- Kemp, D. R. (1978). *The growth rate of wheat leaves in the field: An analysis of the effects of temperature, carbohydrates and proteins of the extension zone.* Ph.D. thesis, University of Western Australia.

Books

- Colless, J. M. (1979). Maize. P. 1-36, in J. V. Lovett and A. Lazenby, eds., *Australian Field Crops. Vol. 21—Tropical cereals, oilseeds, grain legumes and other crops.* (Angus & Robertson, Sydney).
- Helyar, K. R. (1978). Effects of aluminium and manganese toxicities on legume growth. P. 207-232, in C. S. Andrew and E. J. Kamprath, eds., *Mineral Nutrition of Legumes in Tropical and Subtropical Soils.* (CSIRO Melbourne).

Other Publications

- Chase, D. L. (1978). What soybean variety should I grow? *I.R.E.C. Farmers' Newsletter* 109: 4.
- Cooper, J. L. (1978). Nitrogen fertilizer for sod-seeded wheat. *I.R.E.C. Farmers' Newsletter* 106: 12.
- Doyle, A. D. (1978). Nitrogen requirements for wheat in northern N.S.W. *Bulk Wheat* 12: 55.
- Hartley, R. A., Lewin, L. G. and Bacon, P. E. (1978). Research on topdressing Inga. *I.R.E.C. Farmers' Newsletter Large Area Issue* 108: 7.
- Lacy, J. M. (1979). Crushing plant ensures demand in the Murray. *Sunflower* 3 (1): 10.
- Launders, T. E. (1979). Nitrogen improves profitability from winter forage. *Grow May*, p. 4.

- Lewin, L. G. and Hartley, R. A. (1978). Research on continuous rice cropping. *I.R.E.C. Farmers' Newsletter, Large Area Issue* 108: 19.
- Lewin, L. G. and Hartley, R. A. (1979). Rice breeding in N.S.W. *Rice Mill News* 11 (17): 37.
- Leys, A. R. (1979). New Herbicides—how they perform—how to use them. *Hard and Soft Wheatgrowers' Newsletter* p. 3.
- Martin, R. H., Ferns, G. K., Fitzsimmons, R. W. and Wrigley, C. W. (CSIRO) (1978). *Australian Wheat Varieties Supplement No. 1*.
- Martin, R. H., Khan, M. A. and Fisher, J. A. (1978). Progress report on wheat breeding programme of Agricultural Research Institute, Wagga Wagga. *Annual Wheat Newsletter* (Produced by Kansas State University and Canada Department of Agriculture) XXIV: 36.
- McDonald, W. J. (1978). Molybdenum—if its short yields will suffer. *Sunflower* 2 (2): 22.
- Sutherland, S. (1978). Combines—archilles heel of sunflower. *Sunflower* 2 (2): 14.
- Thompson, J. A. (1978). Identification of physiological maturity. *Sunflower* 2 (4): 8.
- Thompson, J. A. (1978). How often do soybeans need irrigating? *I.R.E.C. Farmers' Newsletter* 109: 8.

DIVISION OF RESEARCH SERVICES

New South Wales Department of Agriculture Publications

- Holligan, P. J. and Pearson, J. G. (1978). Cone seeders. *Agricultural Engineering Centre Technical Report* 78: 1.
- Holligan, P. J. and Pearson, J. G. (1978). Fruit picking and pruning platform. *Agricultural Engineering Centre Technical Report* 78: 2.
- Holligan, P. J., Wedd, S. and Pearson, J. G. (1979). A broadcast rice seeder. *Agricultural Engineering Centre Technical Report* 79: 1.
- Lee, T. K., Danh, H. G., Wingate-Hill, R. and Garland, P. J. (1979). Using a desktop programmable calculator as an aid to farm machinery management. *Agricultural Engineering Centre Technical Report* 79: 4.
- Lund, R. D. (1979). Report on Australian wool harvesting programme. *Agricultural Engineering Centre Internal Report* p. 1.
- McMahon, P. J. (1979). Pneumatic seed planters. *Agricultural Gazette of N.S.W.* 90 (1): 32.
- Pearson, J. G. and Holligan, P. J. (1978). Bulk bin weighing machine. *Agricultural Engineering Centre Technical Report* 78: 3.
- Pearson, J. G. and Wedd, S. (1978). Modified pearlographs for wheat hardness testing. *Agricultural Engineering Centre Technical Report* 78: 4.
- Wedd, S. (1978). Don't confuse power with pull. *Agricultural Gazette of N.S.W.* 89 (4): 29.
- Wedd, S. (1978). Magnetic seed treaters—beware! *Agricultural Gazette of N.S.W.* 89 (6): 18.
- Wedd, S. (1978). Bush fire prevention with the 'Brompton Rat'. *Agricultural Gazette of N.S.W.* 89 (6): 42.
- Wedd, S. and Wingate-Hill, R. (1978). Mechanical onion harvesting. *Agricultural Gazette of N.S.W.* 89 (5): 4.
- Wedd, S. (1979). Vee belt drives. *Farm Mechanisation and Engineering Bulletin* ME8.
- Wedd, S. and Garland, P. J. (1979). Grain shed construction. *Farm Mechanisation and Engineering Bulletin* ME9.
- Wedd, S. and Sutherland, J. W. (1979). Building a radial flow batch grain drier. *Farm Mechanisation and Engineering Bulletin* ME7.
- Wingate-Hill, R. (1978). Calculating the cost of owning and operating farm machinery. *Agricultural Engineering Centre Technical Report* 78: 5.
- Wingate-Hill, R. (1979). *Publications Index 1970–1979*.

Contributions to Journals

- Danh, H. Q. and Wingate-Hill, R. (1978). Number of field work days available for tillage. *Mechanical Engineering Transactions, Institution of Engineers, Australia* ME3: 37.
- Finlayson, W. H. (1978). Grain cleaning—way to avoid dockages. *Bulk Wheat* 12: 18.
- Finlayson, W. H. (1978). Grain dryers—a comparison of types and designs. *Bulk Wheat* 12: 59.
- MacDonald, D. J. (1978). Rice and its adaptation to world environments—Farrer Memorial Oration, 1977. *Journal of the Australian Institute of Agricultural Science* 44: 3.
- Marcellos, H. and Single, W. V. (1979). Supercooling and heterogenous nucleation of freezing in tissues of tender plants. *Cryobiology* 16: 74.
- Spence, T. B. and Smith, A. N. (1978). Granule size of phosphate fertilizers. *Journal of the Australian Institute of Agricultural Science* June: 129.
- Wedd, S. (1978). How to calibrate a combine seeder. *Power Farming* 88 (3): 19.
- Wedd, S. and Wingate-Hill, R. (1979). What price hardfacing? *Power Farming* 88 (4): 13.

Contributions to Technical Conferences

- Brown, G. A. (1978). Field performance of a citrus harvester. *Institution of Engineers, Australia Conference on Agricultural Engineering, Toowoomba*.
- Brown, G. A. (1978). Design and performance of mechanical harvesting equipment for cherries. *Australian Cherry Growers Conference Young*.
- Brown, G. A. and Hutton, R. J. (1978). Machinery for harvesting citrus fruit. *XXth International Horticultural Congress, Sydney Abstract* 1269.
- Brown, G. A. and Hutton, R. J. (1978). Advances in mechanical harvesting of temperate tree fruits. *XXth International Horticultural Congress, Sydney Abstract* 1555.
- Brown, G. A. and Hutton, R. J. (1978). Notes on the citrus air harvester. *Citrus Field Day Mildura Horticultural Research Station*.
- Brown, G. A., Hutton, R. J. and Greenhalgh, W. J. (1978). Machine harvest concepts for fresh market cherries. *XXth International Horticultural Congress, Sydney Abstract* 1550.
- Danh, H. Q. and Wingate-Hill, R. (1978). Number of field work days available for tillage. *Institution of Engineers, Australian Agricultural Engineering Conference, Toowoomba* p. 187.
- Garland, P. J. (1979). Decision-making aids in tractor selection—N.S.W., Australia. *Joint Meeting of American Society of Agricultural Engineers and Canadian Society of Agricultural Engineers Paper No. 79–1026*.
- Garland, P. J. and Marston, D. (1979). Water erosion reduction through stubble mulching, success and problems—N.S.W. Australia. *Joint Meeting of American Society of Agricultural Engineers and Canadian Society of Agricultural Engineers. Paper No. 79–2057*.

- Holligan, P. J., Pearson, J. G., Wingate-Hill, R. and Frost, R. B. (1978). Design and construction of a citrus harvester. *Institution of Engineers, Australia. Agricultural Engineering Conference, Toowoomba* p. 238.
- McDonald, D. J. and Dear, B. S. (1977). Wheat nitrogen requirements following rice. *Australian Cereal Agronomy Conference, Perth. Working Papers* 49: 8.
- McDonald, D. J. and Dear, B. S. (1977). High yields from wheat sown into rice stubble using minimum cultivation. *Australian Cereal Agronomy Conference, Perth. Working Papers* 8: 14.
- McDonald, D. J. (1978). Plant breeding. *Proceedings, 3rd Combined Technical Seminar, Australian Technical Millers Association, Griffith* 12th and 13th October.
- McDonald, D. J. (1978). Dry Seed for aerial sowing. *Annual Rice Field Day, Agricultural Research Centre, Yanco.* March.
- McMahon, P. J. and Smith, G. W. (1978). Transverse distribution patterns of a pneumatic combine drill. *Institution of Engineers, Australia. Agricultural Engineering Conference, Toowoomba* p. 11.
- Magill, R. J. (1978). A multiple bin laboratory grain drier. *Institution of Engineers, Australia. Agricultural Engineering Conference, Toowoomba* p. 345.
- Wingate-Hill, R. (1978). Preliminary economic evaluation of a mechanised orange harvesting system. *Institution of Engineers, Australia. Agricultural Engineering Conference, Toowoomba* p. 234.
- Wingate-Hill, R. and Danh, H. Q. (1978). A discounted cash flow programme for agricultural machinery investment decisions. *Institution of Engineers, Australia. Agricultural Engineering Conference, Toowoomba* p. 183.
- Wingate-Hill, R., Davis, G. R. and Bowditch, H. G. (1978). Wear of hardfacing treatments applied to shares of tined tillage implements. *Institution of Engineers, Australia. Agricultural Engineering Conference, Toowoomba* p. 7.

Books

- Wingate-Hill, R. (1978). Tillage requirements for cereal crop production and their relationship to the development of new tillage machinery. Chapter 48 in W. W. Emmerson, R. D. Bond and A. R. Dexter, eds., *Modification of soil structure* (John Wiley and Sons, Chichester, England).

ROYAL BOTANIC GARDENS AND NATIONAL HERBARIUM

New South Wales Department of Agriculture Publications

- May, V. (1978). Ferric alum can reduce toxic algae in farm dams. *Agricultural Gazette of N.S.W.* 89 (4): 6.

Contributions to Journals

- Armstrong, J., Brennan, G. and Forlonge, J., (1978). Nursery hygiene—the key to successful container grown native plants. *Australian Parks and Recreation* August p. 25.
- Blaxell, D. (1978). Notes on Australian Orchidaceae—a new combination in *Liparis*. *Telopea* 1: 357.
- Blaxell, D. (1978). Type specimens of Schlechter's names in Orchidaceae at the Conservatoire et Jardin Botaniques, Geneve. *Telopea* 1: 359.
- Blaxell, D. with Hindmarsh, M. M. (1978). A new species of *Stylidium* (Stylidiaceae) from the Sydney Region. *Telopea* 1: 365.
- Briggs, B. G. and Johnson, L. A. S. (1979). Evolution in the Myrtaceae—evidence from inflorescence structure. *Proceedings, Linnean Society of N.S.W.* 102: 157.
- Briggs, B. G. with Ramsay, H. P. (1979). The Bryophyte and Lichen collections at the National Herbarium of N.S.W., Sydney. *Australian Systematic Botany Society Newsletter* 18: 13.
- Johnson, L. A. S. and Briggs, B. G. (1978). The plant family Proteaceae. *Australian Plants* 9: 303.
- Lee, A. T. (1978). Some species of *Crotalaria* in Australia. *Telopea* 1: 319.
- May, V. (1978). Areas of recurrence of toxic algae within Burrinjuck Dam, N.S.W., Australia. *Telopea* 1: 295.
- May, V. (1978). New records for Australian algae. *Telopea* 1: 315.
- Thompson, J. (1978). Polygalaceae. *Flora of N.S.W.* No. 112.
- Tindale, M. D. (1978). Notes on Australian Taxa of *Acacia* No. 5. *Telopea* 1: 371.

REPORT OF THE PRICKLY-PEAR DESTRUCTION COMMISSION FOR THE YEAR ENDED 30TH JUNE, 1979

The Hon. D. Day, M.P.,
Minister for Agriculture.

Sir,

I submit the report of the Prickly-pear Destruction Commission for the year ended 30th June, 1979.

Mechanical and biological measures to control and eradicate prickly-pear were continued throughout all infested areas of the State during the year. Co-operation and good relationships were maintained with Federal and State government departments, shire and municipal councils, pastures protection boards, trusts, private organizations and individual land owners.

The Commission is having difficulty controlling Tiger Pear (*O.aurantiaca*). Seasonal conditions during the past eight years have been above average in most Tiger Pear-infested areas, which have greatly assisted growth of this pest. The high grass cover due to wet conditions has made spraying operations difficult. In addition, chemical control measures are costly and many land owners cannot afford the high costs involved. Biological control of Tiger Pear is being used wherever possible to avoid expensive spraying operations.

There are problems associated with biological control of prickly-pear in New South Wales. The insects used to control prickly-pear, cactoblastis and cochineal, have not been very successful in some areas of the State in the past. Two scientific officers, who are based at the Agricultural Research Centre at Tamworth, are continuing with investigations into biological control of prickly-pear. Particular attention is being given to control of Tiger Pear with cochineal insects.

The Commission has continued to make supplies of prickly-pear insects available to land owners free of cost. The insects are liberated and spread on properties where considered warranted. Excellent results are being achieved with biological control in areas of the State where climatic conditions are favourable for the insects to work.

The cochineal insects used to control Tiger Pear are very delicate and can be wiped out by adverse weather conditions such as heavy rain and cold weather. They do not have a satisfactory means of spreading from plant to plant and require assistance. This is done by collecting infested segments from plants under attack to put on plants with no insects. It is difficult to get some land-holders to co-operate and spread insects. Cochineal insects will not do a satisfactory job unless they are systematically hand-spread at frequent intervals during the summer and autumn seasons.

The Commission provides assistance to owners of prickly-pear infested properties. Gangs of men are available for hire from the Commission to carry out prickly-pear eradication work and the work is done on a dollar for dollar basis. A prickly-pear spray is supplied at cost price and, when it is being purchased to eradicate Tiger Pear, it is supplied at half price. Spraying equipment is available for loan at no charge. In addition, assistance is given to government departments, both State and Commonwealth, shire and municipal councils, pastures protection boards, trustees of commons, cemeteries, parks and reserves, to destroy prickly-pear on lands under their control. The cost of free eradication work and free prickly-pear spray supplied during the year to land owners, government departments and instrumentalities amounted to \$143,340.

The methods used to control and eradicate prickly-pear are spray with chemicals, biological control, cultivate the land and burn or bury the plants. The spray chemicals are very effective and good results are achieved with biological control. Cultivation of the land, particularly for Tiger Pear eradication, is used wherever possible and has proved very successful. Burning or burying prickly-pear is suitable only for destruction of small infestations.

Prickly-pear spreads by seeds and segments. The seeds are spread mainly by birds and segments by water and animals. Most districts of New South Wales are infested with prickly-pear, but the heavier infestations are confined to the central western slopes and plains, the north western slopes and plains and the Hunter River Valley.

The destruction of prickly-pear on all unoccupied Crown lands is the responsibility of the Commission. The work was continued throughout the year and the cost to maintain these areas free from prickly-pear was \$42,462.

Prickly-pear eradication work, which cost \$143,223, was carried out under contract by the Commission for 190 private land owners. Some owners were assisted, regarding payment for the work, by allowing them to pay by instalments over a period of years at a low interest rate.

The total expenditure by the Commission for the year ended 30th June, 1979, was \$1,132,263.67 (an increase of \$92,412.28 compared to last year).

Sundry debtors were decreased by \$9,636.16 during the year. The amount outstanding is \$17,074.05 (compared to \$26,710.21 last year).

There were fifty Prickly-pear Leases covering an area of 22 787 ha at 30th June, 1979, of which thirty-two (13,951 ha) were leases in perpetuity.

The Prickly-pear Destruction Commission has a staff of three administrative officers, two scientific officers engaged on research work and fifty-seven men on field duties. The staff comprises ten Public Service Board appointees and fifty-two employees under the Prickly-pear Act. The field staff operate from office and depot facilities located at Dubbo, Mudgee, Singleton, Scone, Tamworth, Bingara, Moree, Ashford and Mungindi.

A statement of income and expenditure of the Prickly-pear Destruction Commission for the year ended 30th June, 1979, follows.

V. H. GRAY,
Commissioner.
16.7.1979.

PRICKLY-PEAR DESTRUCTION COMMISSION
Statement of Income and Expenditure as at 30th June, 1979

	\$		\$
Balance in fund at 30th June, 1978 ..	88,510.61	Salaries, wages, allowances, workers compensation and payroll tax ..	665,828.21
Special appropriation	60,000.00	Salary items not subject to payroll tax ..	9,333.53
Supplementation from Consolidated Revenue	795,000.00	Travelling allowances and expenses ..	52,968.41
Miscellaneous income	191,794.84	Maintenance of motor vehicles ..	82,795.11
		Purchase of motor vehicles and caravans ..	143,813.50
		Purchase of stock and plant	89,227.15
		Minor equipment and stores	22,247.91
		Rents and rates	9,236.71
		Postal and telephone charges	4,265.41
		Freight and cartage	565.37
		Buildings and improvements and insurances	51,982.36
			\$1,132,263.67
		Balance in fund at 30th June, 1979 ..	3,041.78
	\$1,135,305.45		\$1,135,305.45

